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STRUCTURAL CHANGES IN THE WORLD MINERALS INDUSTRY DURING THE 1980s

Report by the UNCTAD secretariat

Note: In some cases, the country terminology used in this report is the terminology that was current during the reporting period. For further information on geographical terminology, see Section I.C of the report.

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STRUCTURAL CHANGES IN THE WORLD MINERALS INDUSTRY

CONTENTS

	Pages
INTRODUCTION	1
I. METHOD	
A. Means of control	3
B. Method of measuring control	4
C. Geographical terminology	5
II. LOCATION OF PRODUCTION	
A. Developed market economy countries	6
B. Developing countries	8
C. Centrally planned economies	9
D. Discussion	11
III. CORPORATE CONTROL BY ECONOMIC GROUPS AND REGIONS	
A. Overview	13
B. Developments by region	16
C. Discussion	28
IV. CORPORATE CONCENTRATION	
A. Overview	31
B. Causes of corporate concentration	33
C. Regional differences	33
D. Oil companies	34
E. Total corporate concentration	35
V. STATE CONTROL	
A. Background	39
B. Overview	41
C. Differences among countries	44
VI. IMPLICATIONS FOR DEVELOPING COUNTRIES	
A. Forces leading to structural change	45
B. Outlook	47
Bibliography	49
Appendix	51
Statistical annex	60

INTRODUCTION

The present report is based on a statistical study undertaken for the UNCTAD secretariat by the Raw Materials Group, Stockholm, Sweden. In order to limit the overall size of the report, only some of the underlying statistical material and analyses are presented. The UNCTAD secretariat is responsible for the interpretation of the data.

The objective of the report is to review and analyse structural changes in the international non-fuel minerals industry, focusing on important trends during the period 1975 - 1989. The structural changes discussed result from a number of factors related to both the supply and demand situation for the minerals studied. The report concentrates on the supply side. The calculations on which the study is based were mainly carried out in 1991.

In order to cover the mineral industries of major economic importance the following metals and minerals have been studied:

Mining stage: Bauxite, coal, copper, gold, iron ore, manganese, potash, phosphate rock, nickel, lead, tin and zinc.

Refining and smelting stage: Alumina, aluminium, copper, nickel, lead, tin and zinc.

A continuous restructuring process is transforming the patterns of ownership of mineral and metal producing operations in the world. During the 1980s long established companies disappeared and new companies emerged. The restructuring was the outcome of the prolonged and deep crisis that the world minerals and metals industry experienced during the early and mid-1980s, and which was caused by changes in the demand and supply pattern for many of the most important metals and minerals.

Demand for many minerals and metals increased at significantly lower rates in the 1980s than during earlier periods. This was partly due to the low rates of overall economic growth. Decreases in the intensity of use of many traditional non-ferrous metals were also important, however, since the service sector, which expanded rapidly during the period, has low metals intensity.

Supply of most minerals and metals increased during the 1980s. In the early 1970s, the Club of Rome report and other forecasts foresaw a shortage of many important minerals. Following the oil crisis, large funds, in many cases from oil companies, were channeled into mining investment, resulting in a dramatic expansion of mine capacity in the late 1970s and early 1980s. The rise in production of secondary or recycled metal resulted in a further increase in the supply of some metals.

Supply has remained at fairly high levels because some producers have kept production volumes constant in spite of decreasing demand and lower prices. These producers may have done so because they believed that demand would soon increase again, or because they were able to cover operating costs and were unwilling to close as long as their revenues contributed to cover capital costs, or because exit costs were unacceptable in financial or social terms.

As a result of developments on both the demand and supply sides, metal prices fell to extremely low levels during the 1980s. Only from 1987/88 did a price recovery take place as demand caught up with supply.

The crisis hit mining companies in the United States particularly hard: the share of the United States in world production of refined metals fell markedly, as did the share of world production, at both the mining and the refining stage, controlled by companies based in the United States. While the decline in national refined production was probably due to rising costs, partly as a result of more stringent environmental regulations, the decrease in the share of controlled production appears to indicate a retreat from the international scene by United States companies. Developing countries have experienced an increase in their share of world production at all stages, and the share controlled by companies in these countries has increased as well. Australia has also seen its share of world production increase, with domestic companies accounting for most of the additional production.

I. METHOD

A. Means of control

The concept of control is crucial when studying changes in corporate structure. To be in control is to have the possibility of acting decisively on strategically important issues. Such issues include the broad policies of a company, decisions on large investments, buying or selling of subsidiaries and power to appoint or dismiss management.

Traditionally, direct control through ownership has been the most important means of control over a mining company and it is often assumed that ownership and control are identical. Control can however be exercised through many means, of which ownership is only one, although the most important. The extent of control exercised by the owners or the management of a company is nevertheless limited not only by purely external factors such as market developments and general availability of investment funds, but also by the existence of other arrangements such as marketing contracts, proprietary technology and financing arrangements. Thus, even holding a majority of the equity in a company may not be sufficient to be in full control.

There are indications that some of the indirect ways of exercising influence are gaining importance, thus diluting to some extent the degree of control exercised through ownership.

The rapid growth of the so-called New Forms of Investment (NFI), particularly during the 1970s, has rendered the task of determining who actually controls a given company more difficult, although in the non-fuel minerals sector NFI have not, during the last few years, grown at the same high rates as in the 1970s. In mining the most usual forms of NFI have been: minority equity investments by foreign companies, loan finance in exchange for either long-term contracts for mine or concentrator outputs or in exchange for the sale of equipment or services. The NFI have also made host countries assume some of the risks involved and to some extent they have gained a measure of control over the companies and operations involved.

During the 1980s, technological factors increased in importance as a means of enhancing competitiveness. There are, for example, signs of an emerging new structure within the mining equipment industry. Transnational mining companies like Trelleborg and Outokumpu are creating new, strong groups of equipment manufacturers and the degree of concentration in the industry is increasing. Traditionally, the equipment manufacturers had no ownership ties to mining companies. The new links between mineral producers and equipment manufacturers and the increased R&D efforts in the minerals industry may make access to technology a more important determinant of competitiveness than in the past. Potentially, proprietary technologies could be used to exercise influence over mineral

production and mining companies.

There are signs of a continued scarcity of capital during the 1990s, due, inter alia, to the growing demands for investment funds in the former centrally planned economies. The oil companies, which supplied funding to the mining industry in the early 1980s, may not have left the field altogether, but the flow of capital from this industry to mining is much smaller than it used to be. The stock markets have not been as attracted to mining as they were during the height of the "gold rush" in the mid-1980s. These factors indicate that the control of finance capital will continue to be an important means of influence over the mining industry in the 1990s.

In contrast to the general trend, an example of increased interest in direct ownership is provided by some Japanese companies. Traditionally, Japanese companies have to a large extent been securing their mineral supply through long-term contracts for ore or metal shipments. In return, Japanese smelters have offered long-term financing and sometimes technology, thereby exercising an influence over their commercial partners. There are, however, several recent signs that the Japanese strategy could be changing and that more emphasis may be placed on control through direct investments. The acquisition of holdings in some United States copper and iron ore mines are, along with investments in the Australian iron ore industry and in the Chilean Escondida copper project, examples of this. A contributing factor may have the increasing difficulties faced by Japanese smelters in securing a stable flow of the huge quantities of ores required for their domestic metallurgical industry through simple procurement.

The privatization trend of the late 1980s and early 1990s has been linked to the opening up of many developing countries to foreign investments in the mining and smelting industries. New investment codes and mining laws have been promulgated, offering incentives to foreign investment. The political and economic investment climate in many developing countries has changed considerably since the early 1970s. This trend is likely to lead to diminished direct state control over minerals and increase the importance of the transnational mining companies.

B. Method of measuring control

In this report, the focus is on ownership and management as the main means of control. The data were obtained mainly from corporate sources such as annual reports.

Mineral production in 1975, 1984 and 1989 was identified by producing company and country as far as possible. The year 1975 was selected as a suitable starting point because the long-term growth pace shifted from high to low in the mid-1970s. Furthermore, the most important nationalizations, particularly in copper, had been completed. Of a number of possible intermediary years 1984 was chosen as having been in the midst

of the deep crisis in the mineral industries and as a year when state ownership control was probably at its highest. Indeed, 1984 marks a divide for many trends analysed. In general, about 95 per cent of world production was identified by company. All of the minerals and metals selected are covered, with the exception of coal in the year 1975 for which it was not possible to find all the relevant information. The sometimes complex ownership patterns, forming hierarchies from producers to controlling companies, were quantified. On the basis of a model developed by the Raw Materials Group, every mineral producer was classified as independent or controlled by one or more parent companies. The criteria for control were based on ownership structure and management contracts. The method was carried out in two steps:

1. Assessing who has control over each mineral producing company or company which owns a mineral producer, and establishing control patterns.

2. Attributing systematically the operating mining companies' production to the controlling company or companies. In order to measure the total production controlled by a company, the value of the production of the different minerals and metals involved was estimated.

A detailed description of the method is included as an Appendix to this report.

C. Geographical terminology

Since only the period up to the end of 1989 is covered, the term centrally planned economies (CPE) is used for countries of Eastern Europe, the former USSR and socialist countries in Asia throughout the report. All Western European countries, together with South Africa, Japan, Israel, the United States, Canada, Australia and New Zealand, are included in the developed market economy group of countries. In accordance with UNCTAD practice, the former Yugoslavia is included among the developing countries.

Unless otherwise indicated, world totals refer to total world production including the centrally planned economies.

II. LOCATION OF PRODUCTION

This chapter reviews the geographical changes in the location of ore and refined metal production at two levels:

Developed market economy countries (DMEC)
- North America
- Western Europe
- Australia
- Japan
- South Africa

Developing countries
- Latin America
- Africa
- Asia

Centrally planned economies (CPE)
- Ex-USSR republics and Eastern Europe
- Other CPEs

Tables 1 to 6 in the statistical annex provide some summary production data for the three main country groups.

A. Developed market economy countries

The developed market economies constituted by far the most important of the three world groups. In 1989 they accounted for half or more of the world's refined production of alumina, aluminium, copper, lead, nickel and zinc and over half of the world's mine production of gold and potash. The other two groups accounted for over half of the world's production in only three cases: developing countries in tin mining and refining and centrally planned economies in coal. The group of developed market economies is not particularly weak in any of the selected minerals except tin. Its share of world production has declined for most minerals, however, contracting more rapidly between 1975 and 1984 than from 1984 to 1989.

North America

North America is the largest mineral producing region in the group of developed market economies. In 1989, North America accounted for over 20 per cent of world mine production of eight of the selected minerals and over 20 per cent of world refined production for three, which is far more than any other region outside the CPEs. The United States accounted for most of the production, but Canada contributed strongly in base metal mining.

North America's share of world production declined between 1975 and 1989 for all of the minerals and metals except gold. The fall in production shares was steepest for phosphate rock mining and for nickel mining and refining. The rate of decline was generally higher between 1975 and 1984, when new environmental

regulations contributed to cost increases, than between 1984 and 1989. In a few cases, such as copper mining and refining, where new technology led to reductions in both environmental effects and in costs, and lead mining and refining, there was even a slight increase after 1984.

Gold is the exception to the general trend. North America's share of world gold production rose from 7 per cent in 1975 to 21 per cent in 1989. Most of this growth occurred after 1984, as new low cost production technologies such as heap leaching, suited in particular to the working of small deposits and of waste from earlier operations, were rapidly introduced.

Western Europe

Western Europe is a large producer of a wide range of minerals and metals, although its production is lower than North American production except for lead, tin and zinc refining and bauxite mining. The most important producers are the Scandinavian countries, Spain and Portugal, Ireland and the former Yugoslavia.

Western Europe's position is particularly strong in metal production, while it is considerably weaker in mining. Lead and zinc refining are most important, accounting for around 25 per cent of world production in 1989. In mining, potash, lead and zinc are the most important. Europe's position is weakest in phosphate, gold, copper, nickel, iron ore and bauxite.

Contrary to the development in North America, shares of world production have generally been stable or have only slightly declined. However, for some minerals, including bauxite, coal, iron ore, aluminium and tin metal, there was a fall in the share of world production between 1975 and 1989, reflecting a loss of competitiveness due, inter alia, to the opening of major low cost deposits of iron ore and bauxite in other regions and increases in power tariffs that raised the cost of aluminium smelters.

Australia

Australia is the world's largest producer of bauxite and is also a large or medium-sized producer of most of the other minerals. Its share of metals refining is relatively less important.

Between 1975 and 1989 Australia's share of world mine production increased for all minerals produced except tin. Most conspicuous was the growth of gold mining, where, as in North America, most of the increase took place after 1984, reflecting the introduction of new mining technology. Production of coal and manganese ore also increased by relatively large amounts. Production of bauxite, alumina and aluminium increased dramatically, with the share of world alumina production rising from 19 to 26 per cent and that of aluminium production from less than 2 to almost 7 per cent, as an increasing proportion of the

domestically produced bauxite was converted to alumina and aluminium before export. Production of all other metals was constant or increased only slightly.

South Africa

South Africa is by far the world's largest gold producer, but its relative position weakened dramatically between 1975 and 1989. South Africa's share of world production is not over 4 per cent for any other of the minerals except coal and manganese. Apart from gold, the general trend in South African production is a significant rise in the share of world production, albeit from a low level.

Japan

Japan has the most clear-cut division between mined and refined production. It is a medium-sized refined producer of the metals examined, except for aluminium, but is an insignificant mine producer. A slightly rising trend between 1975 and 1989 in Japan's share of world production can be noted for nickel and lead refining, although lead as a share of world production has decreased after 1984. For all other metals and minerals the trend is decreasing. Japan's shares of alumina and aluminium production fell from 5.9 and 7.9 per cent in 1975 to 2.1 and 0.2 per cent respectively in 1989, reflecting the impact of energy cost increases on the vertically integrated Japanese alumina/aluminium industry.

B. Developing countries

Developing countries have the largest share of tin mining and refining (about two thirds of world production), followed by bauxite and copper mining (about 45 per cent). Their smallest shares are for potash and coal. Their position is also weak in gold mining and in the refining of all minerals except tin and to some extent copper and alumina.

Developing countries' share of world production increased between 1975 and 1989 for all of the selected minerals and metals except bauxite, lead, manganese and tin ore in which there were small declines. The most notable increases were in refined production of aluminium, copper and zinc, primarily between 1975 and 1984. Developing countries' share of refined tin production, which was already high, increased further, in particular in the late 1980s. Underlying the overall increase in production shares for developing countries are marked differences between regions (and of course, among countries in regions), Latin America and Asia having increased their shares for most minerals and metals while Africa lost ground.

Latin America

Among developing country regions Latin America is the leading producer of the minerals examined. It is strongest in tin, copper, bauxite and iron ore mining, but is also a large or medium-sized producer of most of the remaining minerals. The only weak points are potash and phosphate rock mining. The most important producers are Brazil, Chile and, to a lesser extent, Mexico and Peru.

Between 1975 and 1989 Latin America's share of world production increased for all minerals and metals examined except bauxite and lead metal. The increase was particularly large in copper and tin (both stages), gold mining and aluminium smelting. There was also a substantial increase in phosphate rock mining, albeit from a low level. The largest increases occurred between 1975 and 1984. Bauxite mining declined, however, in particular from 1975 to 1984, due to conflicts between Caribbean governments and transnational companies arising from nationalizations and the introduction of new taxation regimes.

Africa

Africa has a strong position in phosphate rock and bauxite. It is also a large or medium-sized producer of copper. However, Africa's share of world production declined continuously for most minerals from 1975 to 1989. For copper and tin mining and refining, iron ore mining and zinc refining the decreases were substantial. Central and southern Africa were most affected by this decline. Increases occurred only for nickel mining and refining, lead refining, bauxite mining and aluminium smelting. With the exception of nickel, these minerals are produced in western and northern Africa.

Asia

Developing countries in Asia are particularly strong in tin, and their share of world production of all other minerals examined is 2.5 to 9 per cent. The region's share of both mine and refined production increased rapidly from 1975 to 1989. Asia's share of world mine production increased in particular for bauxite, coal, gold and phosphate rock, while it decreased for manganese and tin. The share of world refined production declined for tin, although the region still accounted for 45 per cent of world refined tin production in 1989, while its share in the case of other refined metals incrased twofold or more.

C. Centrally planned economies

The centrally planned economies were strongest in coal (around 53 per cent of world production), manganese (50 per cent), and potash and iron ore mining (around 45 per cent). Their share of total world production was relatively stable during the

period 1975-1989 for most minerals and metals, but it increased significantly for iron ore, manganese ore, nickel ore and metal, tin ore and metal, and phosphate rock. The increase slowed down, however, during the last five-year period as general economic problems started to make themselves felt. The share of world production decreased significantly only for bauxite/alunite and gold mining and copper and zinc refining.

Eastern Europe and the ex-USSR republics

The USSR was a leading producer of manganese and potash with more than 35 per cent of world production. For other minerals and metals except tin and bauxite the share of world production was between 15 and 25 per cent. The other countries in Eastern Europe were not important producers, except for Poland in the case of copper and Hungary in the case of bauxite. Coal production in Eastern Europe remains important.

The rate of growth in mineral production in the USSR was considerably lower between 1975 and 1984 than during the 1950s and 1960s. In the planned economy strong emphasis was placed on heavy industries. There were also vast areas available for exploration and mineral production. Already during the 1980s, however, a decline in the growth of production was recorded as international demand for USSR mineral exports stagnated. For several minerals, including bauxite and copper, there was an absolute decline in volumes of production. There was also a reduction in domestic demand for most metals. A number of factors have been identified as contributing to these trends: infrastructural problems, the inefficiency of the consumer goods industries, a decline in the construction sector and state programmes aimed at reducing excess consumption and waste. The high level of self-sufficiency, which had been one of the cornerstones of socialist raw materials policy, declined, and the USSR became a net importer of bauxite, cobalt, tungsten, tin, molybdenum and zinc. Recent developments cast doubts on the capability of the ex-USSR republics to maintain production at historical levels, in particular if the need for improvements in environmental control and the high costs of production in remote areas with harsh climatic conditions are taken into account.

China and other centrally planned economies

China has been expanding its mineral production rapidly as a result of a strategy of extensive development that has emphasized expansion of production almost regardless of production costs. The high growth rate in China and the Democratic People's Republic of Korea, which are the main mineral producers among the Asian centrally planned economies, was continuous during the whole period after 1975. The most important mineral is coal with more than 20 per cent of total world production. Shares for iron ore, tin, lead/zinc, manganese ore and phosphate rock were also above 10 per cent. Large increases in shares of world production occurred during the period examined

period examined for all minerals and metals except potash.

D. Discussion

In principle, the long-term trends in the location of mining production depend on a combination of geological factors - the likelihood of finding exploitable mineral deposits - and the economic conditions for exploitation (including the economic growth experienced by the region, availability of investment funds, infrastructure and institutional factors). Historically speaking, both these sets of factors have influenced the location of minerals and metals production. The centre of gravity of mine and metallurgical production moved from Europe to the United States in the late nineteenth century as a result of the higher probability of finding new large deposits in the United States and the high rate of economic growth experienced by that country. During the twentieth century the USSR emerged as a major producer of most minerals, reflecting both its enormous resource potential and its rapid industrialization. It may be argued that the "logical" next step in the location process would be an increase in production in developing countries since the probability of finding new major mineral deposits is higher there than in the regions that have already been subjected to more intensive exploration. However, factors other than natural resource endowments are important, as illustrated by the historical development and as seen from developments during the relatively short period addressed in the present study.

During the period from 1975 to 1989, three regions or countries increased their share of world production markedly: Australia, China and Latin America. Developed market economy countries as a group, Eastern Europe and Africa saw their shares fall. What - if anything - did the groups of expanding and contracting countries and regions have in common?

Among those in expansion, it is difficult to find any common denominator except their natural resource endowments - which, however, they share with other regions. In Latin America and Australia the production growth was mainly oriented towards export markets. Latin America's expansion was partly the result of large investments in the 1970s and partly a reflection of the need to generate export revenue to pay mounting external debts. Australia received a major inflow of both exploration funds and investment capital in the 1970s, when it was seen as a more secure supplier than developing countries, many of which had taken a more assertive position vis-à-vis foreign investors than previously. In China, finally, the growth in production largely took place in response to rapidly increasing domestic demand.

The contracting regions and countries can be divided into two groups: those where production growth encountered constraints in terms of geological resources and production costs and those where production growth could not be maintained due to an absence of investment funds and/or inefficient organization of production. Most developed market economy countries belong to the

first group. These countries have been relatively thoroughly explored and few new, major deposits that can be exploited at low cost remain to be found. Increases in production costs arising from higher energy prices, rising real wages and more stringent environmental requirements reduced the competitiveness of the mining and metal industries in these countries during the period studied and led to closures of mines and metallurgical installations. South Africa is to some extent a special case, since the contraction was due to higher costs in gold mining associated with lower ore grades and increasing depth of the mines. The second group consists of Eastern Europe (including the USSR) and Africa. While countries in these regions were by and large able to maintain historical production levels, they were unwilling or unable to attract foreign investment, and they had insufficient domestic capital resources to finance new investment. The lack of foreign investment also had the effect of slowing down technical development in the mining industries of these regions compared to the rest of the world, leading to slower growth in productivity and eventually rendering many installations uncompetitive. Inefficient organization of production and deficiencies in infrastructure also contributed to worsening their competitive position.

There continues to be a clear imbalance between mine production and refined production in both the developed market economies and the developing world. Developing countries mainly remain raw mineral producers while the later stages in the chain of production are concentrated in developed market economy countries. It is notable, however, that in both Latin America and Asia the share of world production of refined metals has increased more rapidly than the share of mine production, indicating that the comparative advantages of these regions are influencing the location of new metallurgical capacity. In the centrally planned economies there has been a more even balance between production of ores and production of metals, reflecting the emphasis placed by these countries on self-sufficiency in raw materials.

III. CORPORATE CONTROL BY ECONOMIC GROUPS AND REGIONS

A. Overview

Control of mine production 1975-1989

Companies in developed market economy countries controlled almost half of world mine production of the selected minerals in 1989 (see table 7 in the annex). Companies based in the United States were the most important, controlling almost 12 per cent of world production, followed by Western European companies. United States and Canadian companies together controlled about 19 per cent of world mine production. South African companies controlled almost 10 per cent of world production and Australian companies 6 per cent. Japanese companies had insignificant control over world mine production. At the mining stage, developed market economy country companies controlled around 65 per cent of total world production of gold in 1989. They controlled between 50 and 60 per cent of the world's bauxite, lead, nickel, potash and zinc production, 40 to 45 per cent of coal and copper production, between 30 and 40 per cent of iron ore and phosphate production, and almost 30 per cent of manganese ore production. Tin was the only exception: developed market economy country companies controlled only 12 per cent.

With few exceptions, the entire mine production of developed market economy countries was controlled by companies based in these countries. However, there are many instances of companies based in one of the countries in the group controlling production in other countries. The ratio between total controlled production and production within the group itself was almost constant at 1.1 throughout the period. There were however significant variations in this ratio within the group, with companies in the United States experiencing a marked decline in the proportion of controlled to domestic production, while the ratio increased for Canadian, Japanese and Western European companies. In 1989, 55 per cent of the total production controlled by Western European companies came from mines outside Europe. The corresponding figures for South African companies were 50 per cent, for United States companies 45 per cent, Canadian companies 40 per cent and Australian companies 35 per cent (see table 12 in the annex for a comparison of mine production in developed countries and mine production controlled by developed country companies). Companies based in developed market economy countries also controlled 15 to 20 per cent of production in developing countries, with the share decreasing during the period.

State-controlled companies in the centrally planned economies were the second group in terms of control share. The bulk of the production within this group was controlled by the

USSR. In the case of this group of countries, controlled production is identical to domestic production, since there was no foreign investment in the countries concerned, and since they did not undertake any investment in other countries.

Developing country companies were the smallest group in terms of control. Within the group, Latin American companies controlled the largest share of production, more than African and Asian companies together. The position of companies and government bodies based in the developing countries is strongest by far in tin, where over 60 per cent of total world production was controlled in 1989. The controlled shares were around 30 per cent of world production for copper and phosphate, 20 to 25 per cent for bauxite, iron ore and manganese, around 15 per cent for gold, lead, nickel and zinc, and less than 10 per cent for coal and potash. The ratio between production controlled by developing country companies and production in these countries increased somewhat during the period, reflecting greater control of domestic production. In 1989, the ratio was 0.87. Developing country companies, which are mainly state owned, control almost no production of the selected minerals outside their home countries (see table 9 in the annex for a comparison of production controlled by developing country companies and production in the developing countries themselves).

Control by developed market economy country companies declined from 56 to 48 per cent in the period 1975 to 1984, with companies in the United States and, to a smaller extent, Western Europe, accounting for the decrease in control. The share of production controlled by Canadian, Australian and South African companies increased. The overall decrease in control of this group of countries corresponds closely to the decrease in its share of world production. Within the group, however, significant interregional investment took place, with European and Japanese companies in particular compensating for a fall in domestic production by investment overseas, mainly in other developed countries such as Australia, Canada and the United States. The share of world production controlled by the centrally planned economies increased from 25 to 29 per cent. Control by developing countries' companies increased from 20 to 23 per cent. Latin American companies' control increased from 8 to 11 per cent of world production. Asian companies' control also increased, albeit from a lower level than in Latin America. Control by African companies declined, reflecting mainly a contraction in the region's share of mine production rather than changes in control.

From 1984 to 1989, the share of control by developed market economy country companies was more or less constant. Japanese and South African companies were the only ones in the developed market economy country group that saw their share of control decrease during the period. The South African companies lost most, with their share dwindling from 15 to 10 per cent as a result of declining domestic gold production. Control by centrally planned economies also declined. Control by developing country companies continued to increase. The changes were mainly

due to changes in output rather than in control over companies. The Latin American companies continued their rapid expansion. The Asian companies increased their share of world production at a slower pace, while the African companies continued to lose shares.

Control of refined production 1975-1989

Control of refined production by companies in developed market economy countries is even more important than at the mining stage (see table 8 in the annex). On average, these companies controlled 58 per cent of total world production of the metals selected in 1989. However, this is to a large extent a reflection of the higher share of world production of these countries at the refined stage, the ratio between controlled production and domestic production being about 1.1 during the entire period (see table 13 in the annex). In almost all regions of the group, this ratio is closer to 1 than it is for production at the mining stage, illustrating the lower degree of internationalization at this stage of the industry. The degree of control exercised by Western European companies is higher than at the mining stage, although the ratio between total controlled production and production within the region is considerably lower. European companies are followed by United States and Canadian companies. The most notable difference from the mining stage is the much stronger position of the Japanese companies. Again, this is much more a reflection of the size of the Japanese metallurgical industry than of the foreign holdings of Japanese companies. South African and Australian companies account for a much lower share of control over world metal production than of mine production, and they also have few interests outside their home countries at this stage. Companies based in developed market economy countries control a significant portion of refined metals production in developing countries, although the share has fallen from 34 to 20 per cent.

As in mining, state controlled companies in the centrally planned economies are the second group. However, their position was not quite as strong as in mining. The bulk of the production within this group was controlled by the ex-USSR. Again, controlled production is identical to domestic production in the countries concerned.

Developing country companies constitute the least important group, with considerably less control than at the mining stage, reflecting their smaller share of world refined production. Again, their position in tin is exceptional, with more than 50 per cent of control. The control in copper, the second strongest metal, reached 26 per cent. For lead, zinc, aluminium and alumina refining, the controlled share was between 10 and 15 per cent, while the position in nickel refining was by far the weakest with only 5 per cent. The ratio between production controlled by companies from developing countries and production in these countries increased over the period from 0.66 to 0.8,

illustrating that foreign ownership diminished significantly in importance (see tables 10 and 11 in the annex).

Control by the developed market economy country companies declined from 64 to 60 per cent between 1975 and 1984, or by about as much as in mining. United States companies were again the largest losers. Contrary to the development in mining, Western European companies did not lose any share of control during the period. Canadian and Japanese control declined slightly. Australian and particularly South African control increased. The centrally planned economies' share of control over world metal production of the metals selected decreased. Control by developing country companies expanded from 11 to 17 per cent, reflecting investments in increased refining capacity mostly made by state mining enterprises. As in mining, both Latin American and Asian companies' shares of control increased sharply, although Asian control was at a lower level. Control by African companies increased only slightly.

During the period from 1984 to 1989, companies from developed market economy countries lost some control, while the centrally planned economies stayed at about the same level. Western European, South African and Japanese companies lost control shares, while United States, Canadian and Australian companies increased their share of control. Developing country companies as a group succeeded in raising their share of control of refined production further to 18 per cent. Latin American and Asian companies continued to increase their control, while the African share of control decreased.

B. Developments by region

Western Europe

Western European (hereafter called European) mine production of all minerals is almost entirely controlled by European companies. The only significant exceptions during the period studied were the Exminesa base metal mine in Spain, which is controlled by the Canadian company Cominco, and a small bauxite mine in France controlled by Alcan. In metal refining, however, the foreign influence in Europe is considerably stronger. European production of many of the minerals and metals declined during the period, while control of foreign production increased. This was the case for bauxite, copper, iron ore, lead and zinc.

The European companies have the most extensive control over foreign production of all groups of countries. Control over mine production of the selected minerals by European companies decreased from 13.4 per cent in 1975 to 10.5 per cent in 1984, and remained at that level until 1988. In 1989 it increased again, to 11.5 per cent. However, the ratio between controlled and regional production increased from 2.8 to 3.5, illustrating that foreign holdings became relatively more important than domestic holdings to European companies during this period. For

all minerals selected, except potash, lead and zinc, mine production outside the region accounted for more than half of total European controlled production in 1989, as in the cases of gold (90 per cent), tin (83 per cent), nickel (80 per cent), bauxite (77 per cent), copper (65 per cent) and iron ore (62 per cent). From the point of view of European companies, the most important countries and regions were the United States, which accounted for more than 25 per cent of the mine production of gold, copper and phosphates controlled by European companies, Australia, where the same was true for production of bauxite and iron ore, and Asia, which accounted for 40 per cent of European controlled tin ore production. The overall share of control was highest for bauxite, followed by zinc, lead and potash, in which over 15 per cent of world production was controlled. It was lowest for manganese and phosphate. Control by European companies of production outside Europe represented a significant proportion (over 5 per cent) of total world production for all selected minerals except phosphates and potash. In the case of bauxite, the share was almost 20 per cent.

At the refined stage, the ratio between controlled and regional production increased more slowly, from 1.12 to 1.19, reflecting a slower decline in regional production combined with a small decline in the controlled share of world production (from 21.8 to 21.3 per cent). Only for tin (66 per cent) did production outside Europe, mainly in Asia, account for more than half of the production controlled by European companies. Production controlled by European countries outside Europe exceeded 5 per cent of world production for alumina, nickel, tin and zinc.

Major changes during the period include declines in the share of control for gold, iron ore and potash, while significant increases in European control were registered for copper, lead and zinc.

European companies controlled large portions of production in other regions, with the following being the most important examples:

- African gold (about 40% of Africa's production was controlled by European companies in 1989), lead (50%) and tin (20%) at the mining stage, and alumina (25%) and nickel (25%) at the refined stage

- Asian lead (20%) and nickel (25%) ore, and nickel (65%) and tin (30%) metal

- Australian bauxite (40%), iron ore (45%), lead (30%), tin (95%) and zinc (35%) at the mining stage, and aluminium (45%), lead (45%) and zinc (50%) at the refined stage

- Canadian copper ore (25%) and lead (20%) and zinc (30%) metal

- Latin American nickel ore and metal (both 40%)

- South African copper (35%), lead (20%) and zinc (45%) at the mining stage, and copper (50%) at the refined stage

- United States gold (30%) and zinc (25%) ore and zinc metal (25%).

The most important European companies were:

- RTZ, United Kingdom. One of the largest mining companies in the world. Bauxite, copper, gold, iron ore, lead and zinc in various regions
- Companies owned by the Government of France. Mainly nickel in New Caledonia.
- Trelleborg, Sweden. Important producer of nickel, lead, zinc and precious metals. Mostly in Europe and North America.
- Hanson of the United Kingdom. Main interests in gold and tin in North America and Australia.
- Metallgesellschaft, Germany. Mines copper, lead, zinc and potash in North America.
- Outokumpu of Finland. Mainly copper, nickel, lead and zinc in Europe and Canada.
- Yugoslav Government. Bauxite, iron ore, copper, nickel, lead, zinc.
- Royal Dutch/Shell group. Produces bauxite, nickel, lead and zinc in South America.
- State of Sweden (LKAB), still the largest iron ore producer in Western Europe.

Several European companies are growing fast as a result of expanding foreign interests. Among these are RTZ, which purchased BP Minerals, Trelleborg, which took over Falconbridge in 1989, Metallgesellschaft, which is expanding its interests in Canadian mining and strengthening its links with Australian MIM, and Outokumpu, which is expanding outside Finland. During the period examined Hanson also took over Consolidated Goldfields from Anglo American and the Belgian Sté Générale expanded its activities in the United States. European companies may now be in a position to increase their share of control in the next few years, particularly taking into account the possibility of increased foreign ownership in the ex-USSR republics.

United States

Unlike the situation in Europe, foreign control in the United States mining industry was significant in a number of minerals, such as gold (about 60 per cent), zinc ore (33 per cent) and copper ore (25 per cent). At the refined metals stage, control by foreign companies was significant only for zinc (25 per cent), aluminium and copper (both around 10 per cent). The degree of foreign control, in particular by European companies, increased markedly during the period.

Control by United States mining companies in the selected minerals from 1975 to 1989 suffered the largest decline among all

regions of origin of companies. In 1975, the average control by United States companies was the highest of all regions at 18 per cent of world production. In 1989, this figure was reduced to less than 12 per cent. Since the United States' share of world mine production declined by less, a large part of the decrease was accounted for by a marked reduction in overseas interests and an increase in the share of United States mine production controlled by companies from other countries, as illustrated by the decline in the ratio between total controlled and domestic production from 1.8 to 1.0. Although the share of United States companies' total control of mine production that was accounted for by production outside the country was 45 per cent, most of this was represented by bauxite, in which virtually all the controlled production took place overseas. For nickel and manganese ore, the situation was similar, although these products were less important in total value terms. For potash and zinc mining, about half of the controlled production was located abroad. The most important regions from the point of view of United States companies were Australia and Latin America for bauxite, Africa for manganese and nickel ore, and Canada for potash. Control by United States companies was strongest in phosphate, bauxite and copper, followed by coal and lead. For a few minerals, control by United states companies outside their home country was significant relative to total world production. This was the case in particular for bauxite, in which the share was 20 per cent, copper, potash and manganese.

Companies in the United States still control a large portion of world production at the refined production stage, although the share decreased markedly during the period studied (from 22 to 17 per cent). This was largely a consequence of declining domestic production, although foreign investment in the metallurgical industry in United States also increased. The ratio between controlled and domestic production declined slightly, but was close to 1 during the entire period. The only instance of another region accounting for a major share of production controlled by United States companies was Australia, where almost 40 per cent of controlled alumina production took place. Total control by United States companies was important for alumina, aluminium and lead (all over 20 per cent of world production), somewhat less so for copper. In the cases of alumina and aluminium, control of foreign assets by United States companies correspond to significant shares of world production.

Major changes during the period include reductions in the share of controlled nickel production (both ore and metal). The decline was also particularly large for zinc (ore and metal), iron ore, potash, manganese ore, bauxite and alumina. Gold was the only mineral in which control by United States companies increased, from 4 per cent of world production in 1975 to 8 per cent in 1989.

Companies based in the United States controlled large portions of production in other regions, with the following being the most important examples:

- African manganese (about 50% of African production controlled by United States companies) and nickel (30%) ore and aluminium (40%)

- Asian copper mine production (30%)

- Australian bauxite (30%) and alumina (40%)

- Canadian potash (25%) and iron ore (20%)

- Latin American bauxite (25%), alumina (35%) and aluminium (25%)

- South African lead ore (45%).

The most important United States companies are:

- Asarco. Copper, lead, zinc in the United States and Peru. Cross links with MIM of Australia.
- Phelps Dodge. Copper, mainly in the United States.
- Cyprus Minerals. Mainly copper in the United States.
- Freeport McMoran. Copper in Indonesia and phosphate rock in the United States.
- International Minerals & Chemicals. Phosphate rock and potash in the United States and Canada.
- Amax. Nickel, lead and zinc in southern Africa and Latin America, aluminium in the United States.
- Magma Copper. Mainly copper.
- Homestake. Mainly gold and zinc in the United States and Australia.
- Alcoa. Bauxite in various world regions and gold in Australia.
- Exxon. Mainly copper in Chile.
- USX. Iron ore in the United States.

The dramatic decline in United States companies' share of control over world production from 1975 to 1984 was partly caused by reduced domestic production. It was, however, also accompanied by major structural changes in parts of the industry, in particular copper and phosphate rock mining, partly as a result of the exit of oil companies from the mining industry, which entailed divestment of foreign assets.

United States mining companies' interests abroad are still concentrated in Latin America although their share of control has diminished drastically. Other regions have therefore become relatively more important, without, however, control of production in these regions having actually increased. Interests in Canadian production have lost in importance. At the refining stage, only the aluminium companies are now active foreign investors with holdings in several regions.

Canada

Foreign control in the Canadian mining industry was

significant for a number of minerals: copper (45 per cent), gold (20 per cent), iron ore (40 per cent), potash (35 per cent), lead (60 per cent) and zinc (45 per cent). The most important controlling companies were based in the United States, Europe and Australia. At the refining stage, foreign control was important for zinc (50 per cent). Following a decrease in control by foreign, mainly United States, companies from 1975 to 1984, the importance of foreign control increased again in the late 1980s as European companies acquired holdings in non-ferrous metal mining and refining.

The share of world mine production controlled by Canadian companies increased from 5 per cent in 1975 to almost 8 per cent in 1989, mainly because domestic companies acquired increased control over production in Canada. The dramatic reduction in domestic production that took place in the United States was not paralleled in Canada. The ratio between controlled and domestic production increased from 0.6 to 0.9. Overseas holdings are important only for bauxite, with production in Africa and Latin America accounting for respectively 35 and 50 per cent of total controlled production, and gold, where production in the United states corresponds to 35 per cent of controlled production. Control by Canadian companies was strongest for nickel (26 per cent in 1989) and potash (16 per cent). For gold, bauxite and zinc the controlled shares were 9 to 10 per cent. Canadian foreign holdings accounted for a significant share of world mine production of bauxite and nickel.

At the refining stage, the share of world production controlled by Canadian companies remained constant at a little more than 9 per cent over the period, or slightly more than the share of domestic Canadian production. Interests in foreign production were significant in the cases of alumina in which foreign holdings in several regions together accounted for 75 per cent of the Canadian company's control (Alcan), and nickel, in which Europe accounted for 25 per cent of Canadian control. The total share of control by Canadian companies was high for nickel (over 25 per cent) and for alumina and aluminium (about 10 per cent). Relative to world production, foreign interests of Canadian companies in alumina, aluminium and refined nickel were significant.

Major changes during the period include a dramatic increase in Canadian companies' control shares for lead, zinc and potash between 1975 and 1984, but the shares decreased again between 1984 and 1989, in the case of lead and zinc to a level even lower than in 1975. Canadian companies' control of gold production increased steadily during the period, particularly between 1984 and 1989. Shares of control over refined production did not change significantly over the period as a whole, although there were variations during the period.

Companies based in Canada controlled significant portions of production in some other regions, with the following being the most important examples:

- African alumina (25% of African production)

- European (40%) and Latin American (25%) nickel metal.

The most important Canadian companies are:

- Inco. Nickel and copper, mainly in Canada.
- Brascan/Noranda. Copper, nickel, lead, zinc, iron ore, gold, potash in Canada.
- Placer Dome. Mainly gold in Canada, Oceania and the United States.
- Lac Minerals. Mainly gold in Canada, Chile and the United States.
- Keevil/Teck. A range of minerals in Canada.
- Province of Saskatchewan. Potash in Canada.
- Echo Bay. Mainly gold in Canada and the United States.

Australia

Foreign control in the Australian mining industry was significant for a number of minerals: bauxite (75 per cent foreign controlled), gold (30 per cent), iron ore (55 per cent), lead (30 per cent), tin (95 per cent) and zinc (35 per cent). At the refining stage, foreign control was important for alumina and aluminium (both 65 per cent) and lead and zinc (around 50 per cent). The most important controlling companies were based in Europe and the United States. Foreign control increased for some metals and minerals, including gold, tin and refined copper and zinc, while it decreased for others, such as bauxite, alumina and aluminium, lead, zinc and iron ore, and refined lead.

The share of world mine production of the selected minerals controlled by Australian companies more than doubled between 1975 and 1989, from 2.7 to 5.7 per cent. Increases in domestic production were partly responsible for the rise, although Australian holdings abroad also increased during the period. The ratio between controlled and domestic production increased from 0.5 to 0.7. Holdings abroad were important for lead and zinc in particular, with 25 per cent of controlled lead ore production and almost 30 per cent of zinc ore production located in Canada. The total shares of world production controlled by Australian companies were highest for lead (14 per cent), zinc (10 per cent) and bauxite (10 per cent).

At the refining stage, Australian control increased from 1.8 to 3.2 per cent of world production, with increased domestic production, particularly of alumina and aluminium, again accounting for the major part of the increase. The ratio between controlled and domestic production remained constant at almost 0.7. Again, overseas holdings were important in lead and zinc, with 60 per cent of controlled metal production located in Europe. The total control shares were highest for alumina, lead, nickel and zinc, where they were all between 5 and 10 per cent.

Australian control shares increased for most of the minerals

and metals selected, in particular for bauxite, alumina, aluminium, coal, gold, lead and zinc.

While Australian companies have increased their foreign interests, they still control only small shares of production in other regions, the exceptions being lead ore in Canada (40%) and refined lead in Europe (30%).

The most important Australian companies are:

- Broken Hill Pty Co. Mainly iron ore, copper and gold in Australia.
- MIM Holdings. Copper, lead and zinc in Australia. Cross links with Asarco of the United States.
- Western Mining. Bauxite, nickel and gold in Australia and North America.
- North Broken Hill Peko. Iron ore, lead and zinc in Australia.
- Giant Resources. Lead and zinc in Canada.

The doubling of the Australian mining companies' share of control over world mine production between 1975 and 1989 was made possible by the emergence of a few strong Australian mining companies, for instance BHP, MIM and Western Mining. These companies have developed capabilities and strengths in financing, exploration and technology, and are experienced enough to develop new deposits all over the world. They have already begun to do so, in particular in South East Asia, but also in Africa, Canada and the United States. They could become an even more important force internationally during the 1990s.

South Africa

In spite of the disinvestment campaigns, foreign control in the South African mining industry is still substantial. At the mining stage it was significant for three minerals: copper (35 per cent), lead (50 per cent) and zinc (40 per cent). At the refining stage it was only important for copper (50 per cent). The most important controlling companies were based in Europe and the United States.

The share of world production of the selected minerals controlled by South African companies increased somewhat between 1975 and 1984, from 14.4 to 15 per cent. After 1984 the controlled share fell to 9.9 per cent in 1989, mainly as a result of the declining South African share of gold production. Production outside the home country declined in significance to South African companies over the period. It remained important, however, in the cases of copper, lead and zinc, where overseas holdings, mainly in other African countries, but also in Canada, accounted for more than half the controlled production. Nickel production in other African countries corresponded to almost 40 per cent of the controlled nickel production. In 1989, the share of world production controlled by South African companies was highest for gold (30 per cent), followed by manganese (15 per cent). The controlled share was below 7 per cent for all other

minerals.

At the refining stage, the South African share of control remained more or less unchanged at less than 2 per cent of world production. Control of production outside South Africa was relatively more important with the ratio between controlled and domestic production falling, however, from 1.8 to 1.3. Copper and lead production in other African countries and zinc production in Canada all accounted for more than half the controlled South African production. The share of world production controlled by South African companies was almost 5 per cent for nickel, whereas for all other metals it was below 3 per cent.

The only region where South African companies controlled large shares of production was the rest of Africa, where at the mining stage they controlled 30 per cent of lead, 70 per cent of nickel and 25 per cent of zinc production, while at the refining stage their control shares were 35 per cent for lead and 75 per cent for nickel. Following the lifting of international sanctions against South Africa, their influence in this region may increase further.

The most important South African companies are:

- Anglo American Corp. of South Africa. The world's largest mining company by value of controlled production. Gold, copper, nickel, lead, zinc and potash in all parts of the world.
- Gencor. Mainly gold, also nickel and aluminium in South Africa.
- Iscor. Iron ore in South Africa and base metals in Namibia.
- Rembrandt. Mainly gold in South Africa.

Japan

Except for a partial holding by Alcan in an alumina refinery, foreign control is not significant in the Japanese industry.

Japanese companies' control over mine production is relatively insignificant. It was below 1 per cent of world mine production throughout the period, declining slightly towards the late 1980s, mainly as a consequence of declining mine production in Japan. The ratio between controlled and domestic production increased from 1.2 to 2.2. For some minerals, notably copper (the United States), iron ore (Australia and Canada), and lead (Latin America), overseas assets accounted for a large part of total control. The shares controlled were not significant, however, for any of these minerals, either in terms of production within the regions concerned or relative to world production.

At the refining stage, Japanese companies are considerably more important, although their controlled share of world production declined from 8 to 6 per cent, reflecting a fall in Japanese production. Control of production in other countries was significant only for aluminium, where almost all the controlled

production was located in Australia and Latin America. Control by Japanese companies was important for copper, nickel and zinc, where it corresponded to between 9 and 10 per cent of world production in 1989.

The most important Japanese companies are:
- Mitsubishi Corp. Copper.
- Mitsui & Co. Ltd. Zinc.
- Nippon Mining Co. Ltd. Copper.

Japanese companies have traditionally shown relatively little interest in expanding through acquisition of assets abroad. Their international activities have instead focused on arrangements intended to ensure a reliable supply of raw materials for their metallurgical installations in Japan, mainly through long-term supply contracts combined with finance. Their influence over management decisions in producing companies is therefore probably understated by their share of control as defined in the present report. There are some recent signs of changes in the Japanese strategy towards a stronger emphasis on direct investments. The acquisitions of parts of some copper mines in the United States and interests in iron ore mining in Australia are examples of such changes.

Latin America

Although the importance of foreign interests in Latin America has decreased in relative terms, it remains significant in absolute terms. North American companies are still the main investors, but European companies are increasing their activities. More than 25 per cent of mine production of bauxite, lead, nickel and zinc and of alumina, aluminium and refined nickel was controlled by companies from outside the region in 1989. With the exception of copper ore, the extent of foreign control decreased over the period 1975 to 1989, mainly as a result of increasing production by Latin American companies, but to some extent also because of changes in ownership. The share of world mine and metal production controlled by Latin American companies has increased continuously since 1975, mainly as a result of expansions by state-controlled enterprises in Brazil and Chile, which have become the world's largest producers of iron ore and copper.

The share of world mine production controlled by Latin American companies increased rapidly from 1975 to 1984, and continued to rise, although at a somewhat lower rate, from 1984 to 1989, when it reached 13.9 per cent. The ratio between controlled and regional production increased somewhat from 0.83 to 0.88, illustrating the relative decrease in the importance of foreign ownership. Latin American companies control no production in regions outside Latin America, with one interesting exception. In 1989, the Brazilian company Caemi purchased a stake in a Canadian iron ore producer, and it now controls 10 per cent of Canadian iron ore production. The share of world production controlled by Latin American companies is highest for tin (31 per

cent), iron ore (28 per cent), copper (19 per cent) and zinc (13 per cent). Over the period, it increased for all minerals selected.

The controlled share of refined production also increased rapidly, from 4 to almost 9 per cent, as a result of expanding regional production. Since foreign companies active in the region increased their production at almost the same rate as Latin American ones, there was only a small increase in the ratio between controlled and domestic production. In 1989, this ratio was almost 0.9. Latin American companies' controlled share of world production increased for all metals, but was highest for tin (23 per cent) and copper (15 per cent).

The most important Latin American companies are:

- State of Chile. The world's largest copper producer.
- State of Brazil. The Western world's largest iron ore producer, producing also bauxite, copper and potash.
- State of Peru. Copper, lead and zinc.
- Industrial Minera Mexico. Copper, lead and zinc.
- Caemi of Brazil. Iron ore.
- State of Venezuela. Iron ore, bauxite and aluminium.

Africa

Foreign control was important for almost all minerals and metals produced in Africa, in particular for alumina, aluminium, lead ore and nickel (both ore and refined), in which companies based in other regions controlled more than half of the production. Only in the cases of phosphate at the mining stage, and copper, lead, tin and zinc refining, was the share of foreign control below 10 per cent. South African and European companies were the main investors, with the interests of Canadian and United States companies generally confined to bauxite, alumina and aluminium. It is possible that South African companies will play an increasingly important role as investors in the rest of Africa as a result of the lifting of sanctions. No major changes in control over production assets took place.

The share of world mine production controlled by African companies decreased from 6.2 per cent in 1975 to 4.9 per cent in 1989, reflecting mainly the falling share of regional production, the ratio between controlled and regional production remaining constant at around 0.8. State-controlled companies in Africa are among the world's largest producers of several minerals, while private regional capital plays a very insignificant role. In contrast with developments in Latin America, however, the production of state-controlled companies has in most cases stagnated and their shares of world production have declined. African companies have no significant holdings outside their home region. The controlled share of world production is over 10 per cent of world production for phosphates and bauxite only.

African companies' controlled share of world refined production decreased from 2.6 to 2.3 per cent over the period, again reflecting the relative decline of regional production. The ratio between controlled and regional production was lower than at the mining stage at 0.65. Copper at 4.8 per cent was the only metal in which the controlled share of world production in 1989 was above 1.2 per cent.

The most important African controlling entities are:

- State of Zaire. Copper and zinc.
- State of Zambia. Copper, lead and zinc.
- State of Morocco. Mainly phosphate rock.
- State of Guinea. Bauxite.
- State of Gabon. Manganese.

Asia

Foreign control is relatively important at the mining stage in Asia, with companies based in other regions controlling significant portions of the production of most minerals, in particular copper, gold, manganese and nickel, in which more than 25 per cent of production is under foreign control. At the refining stage, foreign companies control 80 per cent of nickel production and 30 per cent of tin production. All industrialized regions are represented among the investing companies. Australian companies have recently acquired importance in copper and gold mining. It may be somewhat surprising that Japanese companies have very modest investments in the region. Foreign control has remained more or less constant or declined over the period.

The total share of world mine production controlled by Asian companies increased from almost 4 to almost 6 per cent between 1975 and 1989, reflecting mainly an increase in the proportion of regional production controlled by these companies (the ratio between controlled and domestic production increased from 0.8 to 0.95), but also a slightly higher share of regional production in total world production. Asian companies, which are mainly state owned, have no significant interests outside their home region. The controlled shares were highest for tin mining (32 per cent) and nickel (11 per cent), but was around 5 per cent for most of the remaining minerals. The shares increased during the period for all minerals except lead and manganese.

The controlled share of world refined production doubled over the period from 2.8 to 5.5 per cent as a result both of increased regional production and of increased control by regional companies over production. The ratio between controlled and regional production rose from 0.5 to 0.85. Only in the case of tin did Asian companies control more than 6 per cent of world production.

The most important Asian companies are:

- State of India. Bauxite, iron ore, copper, lead and zinc.

- State of Indonesia. Tin, nickel and bauxite.
- State of Malaysia. Mainly tin, but also copper and gold.

C. Discussion

The rationale for comparing the degree of control over world mine and metals production among regions is that such a comparison may shed light on some of the factors underlying past structural change in this industry, in addition to presenting a factual description of the current and past situation. While the shares of production controlled by companies in a given region are closely correlated with the region's share of world production, differences in the relative importance of foreign assets in the portfolios of enterprises would be expected to reflect variations in corporate behaviour. Such variations could result from differences in "corporate culture" among countries and regions or in the degree of support to investment abroad accorded by the economic and legal environment of the home countries. Variations in the degree of foreign control over national or regional production would be expected to reflect both the degree of openness to foreign investment and the relative financial, managerial and technological strength of domestic or regional companies.

While the number of companies having significant foreign interests is small and does not allow much generalization, and while the statistical material does not include any data on most of the parameters that would be required for an analysis of differences in corporate behaviour or economic and legal environments, it may nevertheless be useful to comment on the observed differences among regions and the changes that have taken place in the light of the explanatory factors just mentioned.

One observation is that European companies appear significantly more outward oriented than companies based in other developed country regions, particularly the United States and Japan. It is likely that the shrinking domestic resource base of European companies due to depletion of deposits and the loss of competitiveness resulting from cost increases provided incentives for these companies to expand outside their home region. Companies in Japan and the United States were, however, faced with the same difficulties but did not respond in the same manner. By way of explanation, it should first be noted that the activities of the Japanese companies are generally not confined to mining. Rather, they are conglomerates with mining and metallurgy forming only a part of their interests. Consequently, when domestic mining activities declined and alternative uses for the resources released as a result had to be found, they did not automatically turn to mining abroad as a first alternative, but rather to horizontal diversification. Secondly, Japanese companies with interests in mining are generally vertically integrated and the mining stage is not seen as an independent

industrial activity but instead as a supplier of raw materials to subsequent processing stages. Consequently, arrangements that satisfy supply security concerns but that do not entail ownership with its consequent long-term commitment of capital are often seen as preferable. In the case of United States companies, the exit of oil companies from the mining industry may provide at least part of the explanation. When the oil companies, which were mainly based in the United States, divested themselves of their mining and metals interests, they were of course not particularly concerned with ensuring that these interests ended up in the hands of companies based in the United States. As a result, European and other companies with the requisite financial resources were able to acquire these interests. Furthermore, even prior to the divestment of their mining interests, the oil companies had little incentive to continue to invest in an industry that they were beginning to regret having entered in the first place. Consequently, exploration and acquisition activities that would have conserved the resource base of the mining subsidiaries were given low priority. It is interesting to note in this context that the part of the United States industry that has been most successful in preserving a major foreign presence is the aluminium industry, where oil company interests were never significant.

A second observation is the striking difference in performance between companies based in Asia and, in particular, Latin America, on the one hand and those based in Africa on the other. In all three regions, state controlled companies account for the major share of control by domestic companies. However, while state controlled companies in Asia and Latin America have expanded production and in some cases have become major producers on a world scale, African companies have lost market shares and their production has stagnated (see chapter V for a discussion of control by state owned enterprises). Differences in management, which to a large extent reflect variations in the relative operational independence of state owned companies, may explain some of the observed difference in performance. A more serious relative scarcity of domestic investment funds and technological know-how in Africa may be another factor. A third explanatory factor may be the degree of openness to foreign investment. While the share of control by regional companies over production increased in Latin America, production controlled by foreign companies also increased in absolute terms since foreign investment in new projects took place and foreign investors increased the capacity of existing operations, in particular at the refining stage. The presence of foreign investors in Latin America may have acted as a stimulus to the state owned enterprises by providing them with a standard of comparison. The introduction of new technology is also likely to have been facilitated as a result of foreign investment. This contrasts with the development in Africa, where very little new foreign investment took place during the period and where it was only in a few countries that both state owned and foreign companies were represented in the mineral sector. Interaction between state owned and foreign companies was therefore not possible.

A third observation that may merit comment is the difference in the degree of "internationalization" between mining and refining. While operations of major companies are often dispersed among several countries at the mining stage, they are mostly confined to the home country or region at the refining stage. The reason for this is of course mainly that mining has to take place where the deposits are, whereas metallurgical installations are subject to much less constraining locational requirements, thus making locations in the home country - generally in Europe, Japan and North America - more competitive. Closeness to the market and the relative ease of investment in the home country as compared to investment abroad become the main determining factors. The introduction of more stringent environmental regulations in developed countries has, however, reduced the locational advantages of these countries and in some cases it has led to a contraction of the metals industry. It is interesting to note that, in the cases of alumina and aluminium, in which locational requirements are more conditioning than for other metals (alumina refineries tend to be located near bauxite mines because of the high proportion of total costs for bauxite supplies accounted for by transport costs, and aluminium smelters depend on the availability of low cost electric power), major companies have to a larger extent located their production facilities outside their home region.

IV. CORPORATE CONCENTRATION

A. Overview

In this report corporate concentration is measured as the percentage of world production controlled by the largest, the three largest and the ten largest companies. Production in countries of Central and Eastern Europe and socialist countries in Asia is not included in world production since this would make the degree of concentration a partial function of the share of world production in these countries. The results are summarized in tables 15 and 16 in the annex.

Control of mine production 1975-1989

The corporate concentration, measured as production controlled by the ten largest controlling companies, varies from around 50 per cent for gold, lead, zinc and tin to 80 per cent for manganese and potash. Nickel and potash have the highest concentration at the level of the three largest companies, while concentration at the one company level is highest for nickel and gold in which Inco and Anglo American (AAC) control 32 and 27 per cent respectively of total Western world production. For several minerals, the single most important company controls 17 to 18 per cent of world production, while for lead and zinc it controls around 10 per cent.

Nickel has the highest corporate concentration of all minerals under study at all levels except at the level of the ten largest companies, both at the mining and refining stages. This is a reflection of the dominant position of Inco. Potash, manganese and bauxite form a second group. In these minerals the ten largest controlling companies account for around 80 per cent of total Western world production and the three largest control about 40 per cent. Copper, iron ore and phosphate rock form a third group, where the degree of concentration is about 18 per cent for the single largest company, 32 to 37 per cent for the three largest companies and 56 to 68 per cent for the ten largest companies. Lead, zinc and tin have the lowest corporate concentration of all minerals studied at all levels. The figures for lead and zinc are similar: the ten largest controlling companies control approximately 50 per cent of total Western world production. The single largest company controls about 10 per cent. Tin has a lower concentration at the level of ten companies but the single largest tin producer is relatively larger. Gold is a special case. Concentration at the single largest company level is the second highest, while at the level of the ten largest companies it is the lowest of all minerals. This is due to the extreme position of Anglo American, which is by far the largest company, all other companies being considerably smaller.

It is not possible to identify any clear general trend in changes of concentration during the years under study. The changes are relatively minor in most cases. Two minerals exhibit a clear trend over the whole period, namely gold and iron ore. Corporate concentration in gold decreased by half. The decrease was sharpest between 1984 and 1989. This change was due to a number of events, including the rapidly increasing production by established and new producers outside South Africa, which was counteracted during the 1980s by Anglo American's increasing control of GFSA's South African gold mines in 1980 and of the United States gold producer Newmont in the mid-1980s, but it was reinforced in 1989, when Anglo American's control of GFSA diminished and it lost control of Newmont.

Concentration for iron ore exhibits an upward trend with the single largest company's (CVRD) control having grown considerably, and concentration at the level of ten companies increased from around 45 per cent in 1975 to 56 per cent in 1989. The ten largest tin companies also increased their share but not at the same rate as the iron ore companies. Corporate concentration in bauxite fell during the period, although the rate of decrease slowed down in the late 1980s. Nickel and manganese show a somewhat similar pattern, but the single largest company steadily increased its share since 1975 in nickel while the share of the largest company in manganese diminished. The industrial minerals, phosphate and potash, show a stable pattern during the period with a small decrease in corporate concentration. Corporate concentration in copper, lead and zinc increased early in the period and then declined again.

Control of refined production 1975-1989

Concentration at the level of the ten largest companies is about the same at the refining stage as at the mining stage, on average 60 per cent. The single largest controlling companies in refining are, however, generally smaller. They typically control only 15 per cent of total Western world production. At most levels, nickel has the highest concentration at the refining stage as well. The three largest companies control 45 per cent of production, while the largest company, Inco, controls 29 per cent, much more than the average largest company in refining. In tin refining, the single largest company controls around 20 per cent of production while control by the ten largest is 84 per cent. The ten largest aluminium, copper, lead and zinc companies control between 40 and 60 per cent, with the largest company controlling from 7 to 13 per cent.

At the refining stage it is only in zinc that concentration increased significantly all through the period under study. For alumina, aluminium, lead and tin refining, the concentration decreased somewhat at the level of the ten largest companies. No significant changes took place in the degree of concentration in copper and nickel refining.

B. Causes of corporate concentration

It is possible to identify a number of factors which at least partly explain the high level of concentration in the minerals industry. First, the industry is capital intensive, which means that the barriers to entry are relatively high. Second, the technology employed has traditionally been geared to utilizing economies of scale, thus reinforcing the barriers to entry. Third, the geological factor is important. Large, high grade deposits confer a natural competitive advantage on the company that finds and develops them, while companies exploiting low grade ores will find it difficult to achieve competitiveness. The industry developed into a oligopoly during the twentieth century. The level of concentration was probably higher in the 1950s and 1960s than at present. At that time, the advantages held by the largest companies by virtue of economies of scale were reinforced by the practice of producer pricing which provided market control. This price setting mechanism has gradually been replaced by commodity exchange based pricing since the 1970s.

The importance of geological factors is illustrated by the gold and tin industries, both of which have a low degree of concentration at the level of the ten largest companies. In both these industries the barriers to entry are lower due to the existence of high grade occurrences, which can be worked using relatively unsophisticated technology and small amounts of capital. The extremely high degree of control by the single largest companies in gold and nickel is partly explained by the geological characteristics of South African gold fields and the Sudbury nickel district in Canada. The companies that initially controlled these deposits were given a head start on their competitors, which was reinforced and prolonged by strong market control. The large-scale open cast mines common in copper, iron ore and bauxite production provide partial explanations of the relatively higher corporate concentration for these metals. The increase in corporate concentration for iron ore runs parallel to the opening of major mines in the Amazon region by Brazilian producer CVRD. The relatively small size of lead/zinc deposits, which are often found together, may have contributed to the relatively lower degree of concentration in the lead and zinc industries.

C. Regional differences

Differences in degrees of corporate concentration could possibly explain some of the differences in development of the minerals sector between regions. By dividing regional production by the number of producing and controlling companies in the region, a measure of average company size is obtained. Tables 17 and 18 in the annex show the average size of producing and controlling companies by region. Since the size of producing companies is largely determined by the production technology, which decides the optimum size of operations, only controlling

companies are dealt with in the following paragraphs.

The average control share of Western world mine production of individual minerals is around one per cent for controlling companies in all regions except Japan, where it is 0.3 per cent. The low figure for Japan probably reflects Japanese companies' strategy of placing a high priority on ensuring security of supply by other means than direct ownership. If gold is excluded, the figures are largely unchanged, except in Australia and, to some extent, North America, where the existence of "junior" independent gold mining companies affects the results. However, strong forces are acting to merge the small gold companies into larger units in both Australia and North America. Anglo American has for example been trying to defend its position by acquisitions in Australia and North America, but has not been able to maintain its earlier extremely strong position in the gold market. On average, Australian companies control somewhat larger shares of world production (averaging 1.8 per cent if gold is excluded) than the companies in other regions. The North American mining companies are also relatively large (1.6 per cent of Western world production on average if gold is excluded). With the exception of the low figure for Japan, the differences between developed country companies are, however, not large enough to be significant.

At the refining stage, the North American companies are significantly larger than the others, accounting on average for 3.5 per cent of Western world production. The dominance by large North American companies of world production of aluminium and nickel is largely responsible for the high figure. The average share of the European companies is 1.9 per cent. Companies in other regions have an average size of 1.2 - 1.7 per cent of Western world production, except for African companies that control 0.8 per cent on average.

D. Oil companies

The international oil companies entered the international minerals industry during the late 1970s and early 1980s. By the early 1990s, however, many of them had left again. In some cases the ownership links to a financially strong oil company might have helped mining companies to survive the period of low demand and low prices in the mid-1980s. In general, however, the similarities and the synergy between the oil and gas industry and non-fuel minerals mining were less significant than expected, and the economic gains were not as large as anticipated. In 1975, 17 energy companies were active in the production of eight minerals, and were among the largest controlling companies for the minerals concerned. In 1984, the figure had increased to 26 companies but in 1989 there were only 12 companies left. Table 19 *in the annex* lists these companies. Those still active in non-fuel minerals are Amoco, BP, Chevron, Exxon, Freeport, Italian state owned ENI, Mobil, Nerco, Oxy, Royal Dutch Shell, French state owned Elf Aquitaine and Unocal. Of these, Amoco, Exxon and BP have greatly reduced their holdings and have been passive in recent years,

possibly only waiting for the right moment to sell their remaining interests. The oil companies (Freeport, Mobil, Oxy and Elf Aquitaine through Texasgulf) still control almost 20 per cent of Western world production of phosphate rock, around 5 per cent of Western world copper production and 2 per cent of gold production. They also have an important influence on the sulphur market through the marketing of by-product sulphur from refineries.

E. Total corporate concentration

In order to examine the possibility that horizontal integration has increased, that is, that newcomers to the production of one mineral are already established producers of another, the ten largest controlling companies for each mineral (excluding coal) were identified at both the mining and the refining stage. State-controlled mining companies were considered to be controlled by their government even if there were several different companies as, for example, in France. A horizontal integration process would then result in the total number of companies decreasing when corporate concentration for each metal or mineral remains constant. The results are shown in table 20 in the annex. A list of the companies included is given in table 21.

At the mining stage, a slow but continuous horizontal integration process can possibly be identified. In 1975, the number of companies in the top ten positions for any of the eleven minerals was 79. RTZ is found among the top ten controlling companies for six minerals (gold, bauxite, copper, iron ore, lead and zinc) and Anglo American for five (gold, copper, potash, nickel and tin). Cominco is found for four minerals, Noranda for three. In 1984, the number of companies on the list had decreased to 70 but it then increased again to 73 in 1989. RTZ and Anglo American continued to be the most diversified mining companies with eight and five positions among the top ten companies respectively in 1989. RTZ had added potash and tin to its minerals, and AAC had added manganese but lost its position in tin. Canadian Brascan had moved into the third place, among the top ten controlling companies for five minerals.

In refining, the degree of horizontal integration does not appear to have changed. There was a slight increase in the number of companies between 1975 and 1984 followed by a slight decrease between 1984 and 1989. RTZ was again the company name found most often, in 1975 three times (lead, zinc and tin) and in 1989 five times (aluminium, copper, lead, zinc and tin). In 1975 the Belgian Societé Générale appeared four times and Anglo American, French Compagnie du Nord and German Metallgesellschaft three times each. In 1989 Brascan appeared in four metals and German Preussag in three.

A decrease in the total number of companies appearing in either mining or refining would seem to indicate the existence of a vertical integration process. The number of companies

decreased from 95 in 1975 to 87 in 1984 and then increased again to 90 in 1989. The number of companies that were present among the top ten in terms of controlled production in both mining and refining declined from 27 in 1975 to 26 in 1984 and 24 in 1989. The latter result could indicate that the degree of vertical integration lessened. On the other hand, if all the occurrences for any one company among the top ten in both mining and refining are counted, the number rose from 32 in 1975 and 1984 to 33 in 1989. This would seem to indicate that the degree of vertical integration was constant, but that the number of vertically integrated companies contracted as part of a process of increasing concentration. While the changes are too small to be very significant they nevertheless indicate that at least vertical integration did not decrease.

Another indication of the degree of concentration in the international minerals industry is obtained by calculating the value of the total mineral production controlled by a specific company. Table 22 in the annex shows the 50 largest mining companies by value of controlled production at the mining stage. It should be noted that the basis used is the value of production of all minerals, not only the eleven minerals selected for the present study.

The world's largest mining company, according to this method of calculation, is Anglo American, followed by RTZ, and the Brazilian state through its holdings in CVRD and other government owned mining companies. Among the ten largest controlling companies two are South African, two British, one Canadian, one Australian, one from the United States and three (CVRD, Codelco and Gecamines) are companies controlled by developing country governments. The ten largest controlling companies together account for almost 30 per cent of the value of the total Western world non-fuel mineral production. The 50 largest controlling companies control 55 per cent. The following table shows the three largest companies in terms of control of each mineral and metal.

Table 1
Three largest companies by individual minerals and metals in 1989 (share of Western world production)

Mineral/Company	Country	Controlled share %
Bauxite		
Alcoa (Aluminum Co. of America)	USA	17.7
Government of Guinea	Guinea	10.3
RTZ Corporation plc	UK	10.1
Alumina		
Alcoa	USA	20.1
Alcan Aluminium Ltd.	Canada	12.1
Reynolds Metals Co.	USA	8.2

Table 1 (cont)

Mineral/Company	Country	Controlled share %
Aluminium		
Alcoa	USA	13.0
Alcan Aluminium Ltd.	Canada	11.8
Government of France	France	6.6
Coal		
Government of India	India	8.2
Rheinische Braunkohlenwerke AG	Germany	4.8
British Petroleum	UK	4.6
Copper ore		
Government of Chile	Chile	17.7
Phelps Dodge Corp.	USA	7.1
RTZ Corporation plc	UK	6.8
Copper metal		
Government of Chile	Chile	12.1
Phelps Dodge Corp.	USA	6.0
Asarco Inc.	USA	5.3
Gold		
Anglo American Corp.	South Africa	26.5
Hanson plc	UK	4.4
Gencor Ltd.	South Africa	4.0
Iron ore		
Government of Brazil	Brazil	17.5
RTZ Corporation plc	UK	7.5
Broken Hill Pty Co. Ltd.	Australia	6.9
Lead ore		
MIM Holdings Ltd.	Australia	9.4
Fluor Corp.	USA	6.9
RTZ Corp. plc	UK	5.4
Lead metal		
Preussag AG Metall	Germany	7.1
Asarco Inc.	USA	4.4
MIM Holdings Ltd.	Australia	3.7
Manganese ore		
Broken Hill Pty Co. Ltd.	Australia	17.1
USX Corp.	USA	10.6
Government of Gabon	Gabon	8.8
Nickel ore		
Inco Ltd.	Canada	32.4
Government of France	France	7.8
Anglo American Corp.	South Africa	7.1
Nickel metal		
Inco Ltd.	Canada	29.2
Government of France	France	8.0
Brascan Ltd.	Canada	7.5

Table 1 (cont)

Mineral/Company	Country	Controlled share %
Phosphate rock		
Government of Morocco	Morocco	17.1
International Minerals & Chemicals	USA	13.3
Freeport McMoran Inc.	USA	6.6
Potash		
Government of Saskatchewan	Canada	16.6
BASF (Kali und Salz) AG	Germany	14.4
International Minerals & Chemicals	USA	12.8
Tin ore		
Government of Indonesia	Indonesia	13.8
Paranapanema SA	Brazil	9.3
Hanson plc	UK	8.3
Tin metal		
Government of Indonesia	Indonesia	16.5
Paranapanema SA	Brazil	14.9
Straits Trading Co. Ltd.	Singapore	10.8
Zinc ore		
Brascan Ltd.	Canada	9.6
MIM Holdings Ltd.	Australia	5.9
Trelleborg AB	Sweden	5.8
Zinc metal		
Sté Générale de Belgique	Belgium	10.7
Preussag AG Metall	Germany	6.2
RTZ Corporation plc	UK	5.8

V. STATE CONTROL

A. Background

State ownership in the Western world minerals industry is a relatively new phenomenon. In 1950 there was little state-owned mining capacity outside the centrally planned economies. During the 1950s and 1960s state control began to increase. European countries were in the lead in this process. The Swedish Government nationalized the iron ore producer LKAB in 1956 based on a parliamentary decision taken already in 1906. In the United Kingdom British Petroleum was nationalized. A wave of nationalizations of mining assets swept through developing countries in the late 1960s and early 1970s. State control continued to increase, in the developing countries as well as in the developed market economy countries, until the 1980s, when the trend was reversed. Despite the decline in state control in recent years, state-owned mining still represents an important part of total Western world production.

If the state-controlled producers in the centrally planned economies (CPEs) are taken into account, the increasing trend of state control between 1975 and 1984 is reinforced for many of the minerals selected. The CPEs' share of total world production was stable or increasing during the period 1975 to 1989 for most of the minerals and metals studied.

Governments of developed market economy countries are generally not involved in mining as owners, but there are some important exceptions from this rule. First, iron ore has been a sector in crisis for a long time in Europe, and many European governments have intervened in the iron ore operations of their countries. Second, regional and national governments in Canada and France nationalized large parts of their nickel and potash industries in the mid-1970s and early 1980s respectively. In the late 1980s, state participation in mining in France and Canada was reduced by privatizations.

The reasons for establishing state-owned mining enterprises are usually complex and differ both among developing countries and between developing and developed countries. In addition to general political/ideological considerations that led to significant state ownership in many industry sectors in developing countries, there were a number of reasons for government ownership that applied specifically to the mining industry:

- Economic decolonialization and the enforcing of permanent sovereignty over natural resources.

- The mineral industry and the linkages it generates are of such vital importance to the whole development process that the control of these "commanding heights" of the

national economy cannot be left in private hands.

- The appropriation of natural resource rents would mobilize significant funds to be allocated by the state.

- The need for capital in the mineral industry is so great that only the state is able to raise sufficient amounts. The private sector is often too weak.

This goal structure, which reflects a number of national goals, shows the complexity of the mandate given to state mineral enterprises. The diverse range of goals makes it difficult to evaluate the performance of the state mining enterprises. Many of these reasons for nationalizations have been used also in developed countries as well. Important additional motives in the latter countries have been to ease an otherwise unduly painful restructuring process and to save jobs in areas where closing a mine would be disastrous.

Developments in the 1970s and 1980s have shown that the nationalizations did not lead to the economic and social development that was hoped for in the 1960s and the early 1970s. The complex goal structure and a sometimes unclear division of responsibility and authority between the management of the state mining enterprises and the government have often led to failure both in achieving profitability and in fulfilling the political objectives set by the government. Shortfalls in the areas of technical, marketing, financial and managerial know-how have often exacerbated the problems caused by the lack of clear objectives. Consequently, in many cases the state-controlled companies have remained weak and have had to rely on services from abroad, either in the form of expatriate employees or through purchases of technical and marketing services. It should be noted that there are significant differences between regions in this regard. State-owned enterprises in Latin America have been relatively more successful than those in Africa, although the problems mentioned are not absent in Latin America either.

During the 1980s various ways of strengthening state mining enterprises and improving their performance have been tried. The methods that have been employed include establishment of direct market links, downstream integration through the setting up of smelters and semi-fabricators, the establishment of special financing institutions and systematic efforts to replace expatriates. Efforts to establish research and development facilities and to set up mining equipment and machinery production, or at least production of spare parts, have also been made.

Steps taken by developing country governments to improve marketing methods and reduce marketing costs cover a wide range, from granting a monopoly on selling and exporting minerals and metals to a government body to gradually improving marketing knowledge and skills. As the experiences of bodies such as the Minerals Marketing Corporation of Zimbabwe and Prominex and other bodies in Guinea show, it is often difficult for state marketing

bodies to recruit staff with the required skills and to build up the necessary commercial network. The efforts of the Indonesian state-owned tin mining group PT Timah and the Brazilian iron ore producer CVRD have been more successful, possibly because both these organizations have succeeded in establishing direct links to their customers.

Attempts to reduce marketing costs through the establishment of processing facilities abroad have been less frequent. Examples include the Zambian acquisition of a 50 per cent interest in a continuous casting rod plant in France, the investment by Chilean copper producer Codelco in a 40 per cent share in a German copper fabricating plant and the acquisition by Malaysian MMC of a stake in Australian Ashton, which owns part of the Argyle diamond mining company.

State-owned mining enterprises in developing countries have been relatively successful in replacing expatriates with local staff. In Zambia, the so-called Zambianization has been an important overall corporate goal and the number of expatriates was reduced from 7000 in 1965 to 2000 in 1982. In the Venezuelan company Ferrominera Orinoco expatriate technical and management staff working under a management contract with the earlier owners were replaced after an initial period by Venezuelan nationals.

Technological development is possibly the area where the least effort has been made to improve the performance of state-owned enterprises. Only the largest and most successful state mining companies in developing countries, such as Codelco and CVRD, have been able to pursue long-term research and development programmes. The national research organizations in Zimbabwe, at both the ministry and the university level, are unique institutions in Africa in the scope and successes of their research and development work. The embargo on trade with Rhodesia in the 1970s also led to the setting up of a well developed domestic mining equipment industry in Zimbabwe, a development that was unique in Africa.

B. Overview

State control at the mining stage is most important for bauxite, copper, iron ore, nickel, phosphate and tin, in which around 20 per cent of world production is controlled by state owned mining companies. For lead and zinc, such companies account for about 10 per cent of production, while their share of gold production is insignificant. State control over mine production is most important in Africa. In 1989, 70 per cent of the total mineral production in Africa was state controlled. The corresponding figures for Latin America and Asia are 56 and 33 per cent.

The level of state control is lower at the refining stage (14 per cent) than at the mining stage, with the same pattern of differences among the minerals studied. The lower level of state control at the refining stage is due to a number of factors, the

most important being that the small number of refineries and smelters in developing countries at the time of the nationalizations in the 1960s and early 1970s. The most important state holdings at the refining stage in the developing countries are in the copper industry. State holdings in other metal industries at the refining stage are to a large extent Finnish and French.

State control in mining increased until the mid-1980s and decreased afterwards. These trends are strikingly homogeneous among the minerals selected. For nine of the ten minerals, state control increased considerably between 1975 and 1984, and fell significantly between 1984 and 1989. The most important changes in the state-controlled share of mine production took place in the developed market economies, while the share of state control in developing countries was fairly constant during the 1980s. Only in the early 1990s were privatizations of state-owned mining companies in developing countries initiated. At the refining stage, state control went through the same cycle as at the mining stage, with state control increasing for all metals from 1975 to 1984 and decreasing for all except alumina, aluminium and nickel between 1984 and 1989.

Changes in the degree of state control during the 15-year period were due to:

- State intervention
- Corporate transactions
- Changes in production levels.

State intervention covers political decisions to nationalize or increase state ownership as well as to privatize mineral companies or holding companies with interests in the minerals industry. Table 25 in the annex shows the most important nationalizations and privatizations during the period.

Nationalization and other changes in state holdings in mineral companies were the main cause of changed state control in four minerals (lead, nickel, potash and zinc). Changes in ownership of just a few companies affected the picture for each mineral as a whole, as these companies accounted for a large share of Western world production. The nationalization of some of the major potash producers in the Canadian province of Saskatchewan affected the state market share radically. State control in potash increased from a fairly low level to one of the highest in the whole minerals industry. The restructuring by the French Government of the Imétal/Le Nickel/Penarroya group was the main reason why state control in lead, zinc and nickel rose sharply during the period, most significantly in nickel. Nationalization by the French Government was also an important reason, although not the only one, for increased state control in bauxite. Other countries in which the state nationalized or increased state ownership in mining during the period were the Dominican Republic, Jamaica and Liberia.

Only a few privatizations affected the selected minerals

during the period before 1984, but they increased rapidly in importance in the late 1980s. One major privatization before 1984 was the sale of shares in Cia Vale do Rio Doce (CVRD) in Brazil, in which state ownership shrank to 56 per cent in 1983. This change in ownership did not profoundly affect state control, however, because the Government still held a majority of these shares and the other shareholders were small. In 1991, the state share of CVRD was further reduced to 51 per cent. Another privatization, starting in the early 1980s, and perhaps more associated with loss of control, was the gradual reduction in the United Kingdom Government's holding in British Petroleum from 49 to around 30 per cent. The state's influence in mineral production almost ceased with the sale of BP Minerals by BP to RTZ in 1989. The Finnish Government allowed private interests to acquire part of the state-owned company Outokumpu. The Mexican, South African, German, Chilean and French Governments have also carried out major privatizations during the last few years. Privatizations are likely to continue not only in developed market economy countries but also in developing countries. Programmes to allow the entry of private capital into state-owned mining companies are being prepared in many countries on all continents. These programmes may result in a dramatically reduced share of state-controlled mineral production in the 1990s.

Corporate transactions cover the buying and selling of mining companies by a state-owned (wholly or partially owned) company. In contrast to state intervention, political decisions by governments are not necessarily a precondition for corporate transactions, although these transactions may change the level of state control in the minerals industry.

Three minerals (copper, gold and phosphate rock) were substantially affected by transactions made by companies that were fully or partially state controlled. The partially state-owned BP made two major acquisitions during the period: Selection Trust and the United States-based Sohio (BP 55 per cent), which in turn had purchased the United States copper producer, Kennecott earlier. In this way, the British state acquired an interest in the production of a range of minerals around the world, including copper and gold. However, this interest disappeared with the sale of the mineral interests to RTZ. The French SNEA's acquisition of Texasgulf increased state control in phosphate rock. Another example is the Finnish company Outokumpu, which acquired interests in Canadian, Scandinavian and Irish mining companies during the period under examination.

Changes in the production of state companies, finally, was the main reason for increasing state control in iron ore and one of the major causes of the changed levels of state control in bauxite, copper and phosphate rock. In the case of phosphate rock the changes were due to changes in production levels by one state company only, in Morocco.

C. Differences among countries

Tables 23 to 27 in the annex provide an overall picture of state shares of mine and refined production (excluding centrally planned economies). About 25 per cent of the value of all non-fuel mine production in the Western world was state controlled in 1989. States can be divided into four groups according to their shares of the value of all non-fuel minerals produced in the country (see table 26 in the annex):

1. None or only a small part of the country's mine production was state controlled. About 50 countries belong to this group, although 15 of them are very small mineral producers. This group includes the four most important mineral producing countries in the Western world, all accounting for more than 10 per cent of the value of Western world mineral production. They are in order of importance: the United States, Canada, South Africa and Australia. Other important countries in this group are Mexico, New Caledonia, the Philippines, Papua New Guinea, Spain and Colombia.

2. A second group of countries in which some 20 to 80 per cent of the value of the mine production of all non-fuel minerals in the country was state controlled. 17 countries belong to this group. The most important (ranked by state controlled value of mine production) are Chile, Brazil, Zambia, Peru, India, Indonesia, Sweden and Botswana.

3. More than 80 per cent of the country's mine production was state controlled. There are 20 countries with significant mineral production in this group. The most important are Zaïre, Yugoslavia, Morocco, Venezuela, Tunisia, Islamic Republic of Iran, Mauritania, Israel, Togo and Algeria.

4. The value of the mine production controlled by a certain state exceeded the value of the mine production in its own country (which does not necessarily mean that the state controls 100 per cent of domestic production). This is possible for states holding mineral interests not only in their own countries but also abroad. This group consists of four states: France, Finland, Malaysia and Luxembourg.

Only a few countries moved from one group to another during the 15-year period examined. The only important movements were by France, Finland and Malaysia from group 3 to group 4. Privatizations were most common in group 1, in which state control was at a low level. In group 2 there were also some privatizations (Chile and Brazil). But in the countries where the mineral industry was virtually wholly state controlled, only parts of enterprises were sold.

VI. IMPLICATIONS FOR DEVELOPING COUNTRIES

A. Forces leading to structural change

The most important structural changes in the mining and metallurgical industries during the 1980s can be summarized as follows:

- An increasing part of total world production takes place in the developing countries. The rate of change is faster in refining than in mining.

- Corporate concentration appears to be slowly increasing, partly through horizontal integration between different parts of the minerals industry.

- State controlled production is slowly decreasing, primarily in developed countries but also in developing countries.

The structural changes result from a number of factors, some of which are: geology, market developments, changes in energy costs, technological developments, New Forms of Investment (NFI), investment climate including mining law, and environmental regulation. All of these are expected to remain important during the rest of the twentieth century.

Geological factors provide an important part of the explanation of the decline or stagnation in mining production in Europe and the United States. This is to be expected considering that deposits in Europe have been worked for centuries and that most of those with high ore grades have been found and depleted. The same development is also taking place in the United States after more than 100 years of continuous growth. The new growth centres appear to be the republics of the former USSR and developing countries, which have not been as thoroughly explored and have been producing on a large scale for a shorter period. The speed of the transfer of production from one region to another depends on the availability of exploration funds - which in turn depends in large part on perceived investment conditions - and technology. The present lack of investor interest in mineral exploration in Africa, for example, may slow down the process.

Market developments brought on by the recession in the world economy during part of the 1980s led to closures of considerable mining and refining capacity, particularly in the United States. This development, at least in the short run, has led to an increased proportion of total world production taking place in developing countries. The process is mainly irreversible. In some cases, as for example, iron and steel, demand in developed countries is levelling off or even declining. Future growth in

demand for iron and steel will come from the developing countries to which the industry is also slowly relocating. The acute crisis in the European and United States steel industry further increased the speed of the restructuring. In contrast, the bauxite/aluminium industry has experienced almost continuous expansion, and the rapid growth in demand has facilitated the entry of new companies into the industry.

Changes in energy prices have had a major influence on the restructuring process. The two oil price increases in the 1970s affected the energy-intensive refining and smelting industries more than the mining industry. The price rise nevertheless sparked intensive energy saving programmes in the latter as well. The availability of cheap and abundant power has become a major competitive advantage that strongly influences the location of new capacity. Examples from the aluminium industry are the most vivid. Japanese aluminium smelters virtually disappeared in the 1980s and European oil dependent aluminium smelters also had to close down as a relocation to countries with cheap hydroelectric power such as Norway and Canada took place. In the long run developing countries with undeveloped hydroelectric potential will benefit.

Technology has become an increasingly important determinant of competitiveness in the mining and metals industry. During the 1980s, technological developments focused on production cost reductions. The strong trend towards an increased scale of operations lost some of its importance. On the other hand, with the exception of gold extraction, there were few new developments in small-scale mining technology. Technological developments and innovations are increasingly becoming proprietary and used as competitive weapons. There are signs that this trend will become even more important during the 1990s. This will give companies with large R&D spending an advantage. It will not be in favour of developing countries which generally lack the resources in terms of both trained researchers and the necessary funds to develop new technologies or to acquire technologies developed outside. The huge amount of funds needed to succeed in developing new mining methods and mining equipment will further facilitate concentration of the industry.

New Forms of Investment (NFI) became available during the 1970s. In mining the most usual forms of NFI have been: minority equity investments by foreign companies, loan finance in exchange for either long-term contracts for mine or concentrator outputs or for the sale of equipment or services. These sources of capital have lowered the barriers to entry in the mining and metallurgical industries for both developing countries and for independent companies in developed countries.

Investment climate and mining laws remain possibly the most important factors determining the location of new investment. The nationalization of large parts of the mining industry in developing countries in the 1960s and 1970s was followed by a period of strong contradictions between major mining companies and developing country governments. The influence of the

transnational mining companies undoubtedly diminished and there was some room for a choice of development strategy by the state-owned mining enterprises in developing countries. The transnational mining companies reacted by concentrating most of their investment in "politically safe" countries such as Canada, Australia and, to some extent, in Europe. In Africa, very little foreign investment in the mining industry has taken place since the late 1970s. In an attempt to attract the capital needed for investments, several countries have more recently revised their mining codes and offered packages of incentives to prospective investors. This will probably eventually lead to new investment from foreign sources but also to a diminished degree of national control over the mining and refining industry in many developing countries. The process will take, however, a long time considering the large amounts of capital invested during the 1980s in Canada, Australia and Europe.

Environmental concerns in developed countries, particularly concerning acidic gases from metal smelters, have been a major driving force behind the closures of old plants in heavily populated areas in Europe and the United States. In many developing countries that do not have the same stringent environmental regulations, production has increased after these closures. In the long run, however, legislation in developing countries is likely to evolve in the same direction. Consequently, environmental regulations will not be as important a driving force behind structural changes and movements of production capacity between developing and developed countries in the 1990s as it was during the 1980s.

B. Outlook

As discussed above, many of the driving forces in the process of structural change during the 1970s and 1980s have now lost some of their intensity. The balance of power between developing country governments and the major mining companies is again slowly shifting in favour of the companies. This is in line with general developments in the global economy and is not specific to the mining industry.

The corporate concentration in the minerals industries is still high and there are no signs that it will decrease during the next decade. As in all oligopolistic markets the power of the large mining companies to influence important conditions in the industry is considerable. Even if there has been a restructuring and a period of slightly reduced barriers of entry it seems that newcomers such as the oil companies have failed to get a foothold in the industry. Governments of developing countries wanting to develop their mineral industries through new investments will have to depend on the major mining companies. A continuing and possibly accelerated privatization of mining companies in developing countries will further diminish national government control over the use of the natural resources regardless of who takes over the state share of equity.

The degree of vertical integration in the minerals industry does not appear to have increased more than very modestly during the period examined in this study. There are, however, some signs that the process could accelerate in the 1990s. The number of companies active at both the mining and the refining stage is slowly increasing (although among the largest companies it has actually decreased). The technological barriers to entry are becoming higher as technology is increasingly treated as proprietary knowledge and a possible competitive advantage. Companies like the Finnish Outokumpu have been able to combine controlled technology sales with strong growth in its own mining activities. The contacts between the supplier of a mineral concentrate or a metal and the final customer incorporating the metal into a specific product have become more important. Many of the leading mining companies are making efforts to be able to deliver not only a load of metal meeting standard specifications but to adapt their products to the customers' projected future requirements through research and development. This development naturally depends on a close interaction between supplier and buyer. Mining companies in developing countries are placed at a disadvantage by this development since they generally lack the necessary network of contacts with customers.

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Appendix

Method of measuring control

Attributing production

In the present report, control over production is measured by first assessing who has control over each mineral producing company and then attributing the operating mining companies' production step by step to the controlling company or companies. In order to measure the total production controlled by a company, the value of the production of the different minerals and metals involved has been estimated.

The first step, assessing who has control over a given company, is carried out through the application of a number of criteria as follows:

(a) Control over a company is considered to be fully with one owning company if that company

- -is the sole owner
- -owns more than 50% with all other owners having less than 20%
- -owns between 20% and 50% with other owners having less than 5%
- -owns between 20% and 50% and manages the subsidiary company with other owners having less than 10%
- -owns between 35% and 50% and manages the subsidiary company with other owners having less than 20%.

(b) Control is shared between companies owning more than 20 % each if one company owns more than 50 % and one or more companies own more than 20%.

(c) Control is shared between companies owning more than 5 % each if no company owns more than 50 %, except for the last two cases under (a).

In case (a), the entire production of the controlled company is attributed to the controlling company. In cases (b) and (c) the production is attributed among the controlling companies in proportion to their shares of the equity. This means that the smaller shareholders' share of production is allocated to those with holdings above 20 and 5 per cent respectively. The method is illustrated by figures 1 to 6, which show how the production of the Hartebeestfontein gold mine was attributed among its direct and indirect owners. As is seen from the figures, control is attributed to companies through an iterative process using the

decision rules described above. A sensitivity analysis was carried out to evaluate the result when parameters in the model are changed.

Production that could not be identified by company (normally less than 5 per cent of world production) consists mainly of very small operations, such as the garimpeiro gold diggings in Brazil and small tin dredging companies in Malaysia. This production was considered to be controlled by local unidentified interests.

Comparison of three methods of measuring control

In order to assess the validity of the control calculations, data were processed by three methods:

1. **RMG method:** Two degrees of control are distinguished: full control and partial control. If a producer is considered fully controlled, all its production is attributed to the controlling company. If a producer is partially controlled, only a part of its production is attributed to the controlling company. Most often, it is equal to the equity share of capital. But the controlled share is in some cases considered larger than the equity share, since dispersed ownership is distributed among the large owners. Thus, all of the producers' production is allocated to controlling companies at the top of the ownership hierarchies.

2. **Management method:** According to this method, a producer can only be fully controlled or independent, unless the producer is a 50/50 joint venture, in which case production is split equally. Consequently, a producer is fully controlled and all output from a producer is attributed to a controlling company, if the producer is

- managed or administered
- more than 50% owned, regardless of whether there is another large owner
- more than 20% owned and no other large shareholders exist and the producer is not managed by another company (no difference from the RMG method)

3. **Equity method:** Controlled production according to the equity (attributable) method is defined as the producer's output multiplied by the equity share of the holding company. This method results in low levels of controlled production in cases of box-in box ownership, if each subsidiary is only partly owned.

In almost all cases, the equity method produces the lowest figures of corporate control. This is not surprising, since large amounts of production are not attributed to any major controlling company, because the shareholders are too small. Generally, the equity method figures are significantly below those of the other two methods, but there are cases when they are at the same level, or when the equity figures are even higher than the others. The management method generally yields results close to those of the

RMG method, but in a few cases they differ widely. One of these few cases is control of 1989 bauxite production in Africa. United States companies controlled 64 per cent more if the management method was used instead of the RMG method. African companies controlled two thirds less according to the management method than according to the RMG method. The main reason for this discrepancy is the Guinean Government's minority (49%) holding in two bauxite operations. With the RMG method (and also with the equity method), the Guinean state is considered to control 49 per cent, and the foreign, mainly United States, companies share the remaining 51 per cent. With the management method, the foreign companies are considered to control all bauxite production of the two producers.

An extreme example of differences between the results of different methods is South African control in gold mining in 1989. According to the management method, South African companies controlled 30 per cent of world production. The RMG method shows a slightly lower figure. But if the equity method is used, the South African share drops to a mere 11 per cent. In 1975 the differences were still larger: South African companies controlled 60 per cent of world production according to the management method, compared to 50 per cent with the RMG method and less than 5 per cent with the equity method.

It can be discussed which method gives the best picture of control, but clearly each of them portrays only a part of the overall picture. As pointed out above, there are additional factors contributing to control of a mineral producer. But what is important is to make a rough assessmemt of the present situation and the prevailing trends, which can be done fairly accurately. In the present report, the RMG method is used throughout.

Value calculations

When making comparisons between countries or years including several different minerals a weighted average has been calculated using approximate values of the mine and/or refinery production. Figures of prices at the mine stage have been adopted from the French journal Annales des Mines which used to publish such figures regularly. Since 1984 no figures have been published by Annales des Mines and the relative values shown in table 1 are used instead. These values have been calculated based on figures for 1988 supplied by the UNCTAD secretariat.

At the refinery and smelting stage, price data are more easily available. The prices used are shown in table 2.

When calculating the averages alumina has not been included since there is no such corresponding step in the production chain for the other minerals. Coal is also excluded because no figures were available for 1975.

Table 1: Approximate share of total value of world (excluding socialist countries) mine production of all non-fuel minerals in 1988 (per cent)

Bauxite	2.2
Chromite	0.6
Copper	16.2
Gold	23.4
Iron ore	11.5
Lead	1.4
Manganese	0.7
Nickel	14.7
Phosphate	4.6
Platinum group	2.5
Potash	2.6
Tin	1.1
Zinc	3.
Total, minerals in this study	72.1
Other minerals	27.9
Total	100

Table 2: Average annual prices of refined metal (current GBP per metric ton)

	1975	1984	1989
Aluminium	390.4	933.1	1190.3
Copper	556.5	1032.5	1733.4
Lead	186.1	332.4	412.4
Nickel	1765.6	3556.3	8118.2
Tin	3090.0	9187.0	5287.6
Zinc	335.7	668.3	1045.3

FIGURE 1. OWNERSHIP OF HARTEBEESTFONTEIN GOLD MINE, DECEMBER1989

Ownership from right to left.

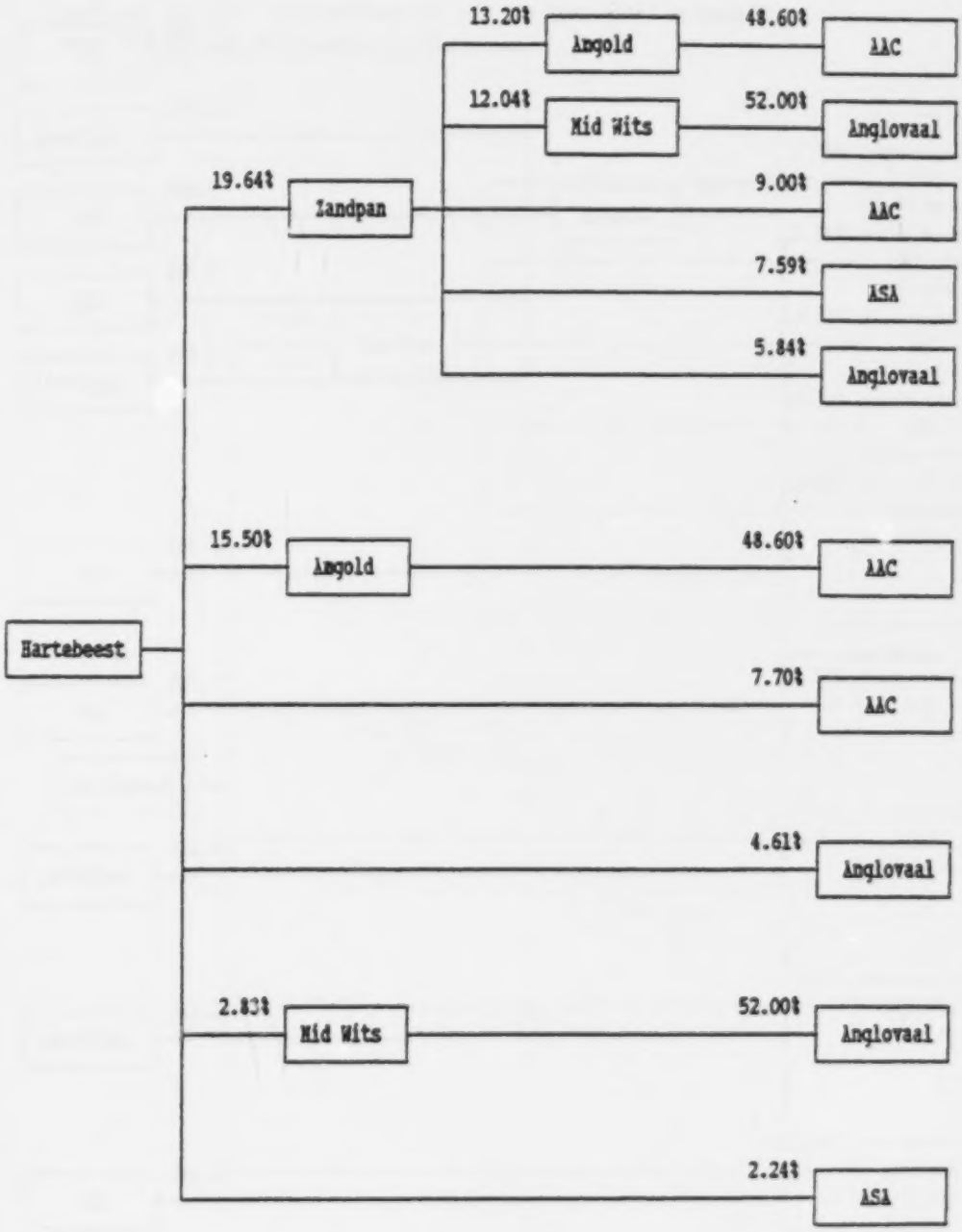


FIGURE 2. CONTROL CLASSIFICATION OF HARTEBEESTFONTEIN.

STEP 1.

Mid Wits is fully controlled by Anglovaal, Angold is fully controlled by AAC.

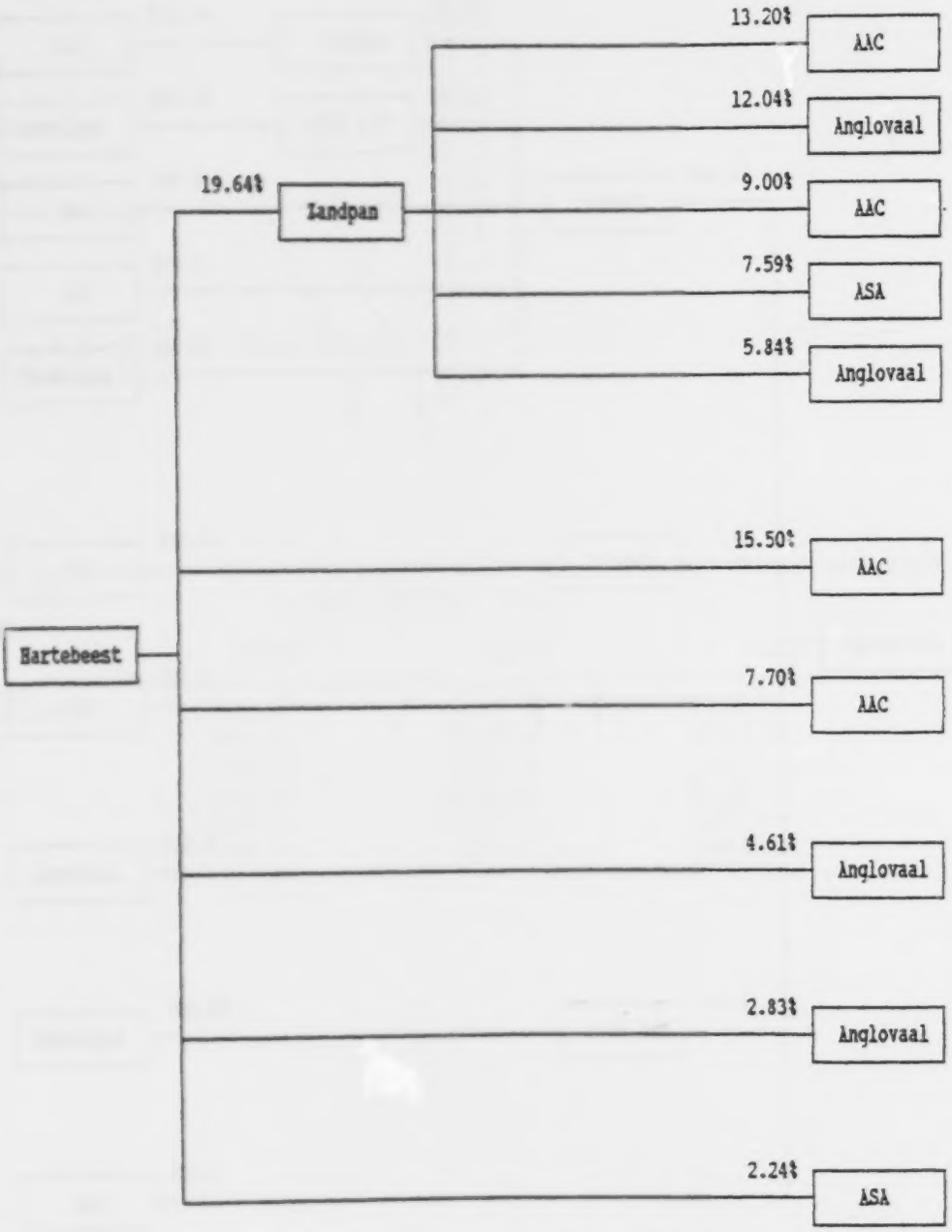


FIGURE 3. CONTROL CLASSIFICATION OF HARTEBEESTFONTEIN.

STEP 2.

Zandpan is partially controlled by AAC, Anglovaal and ASA (in proportion to their holdings). The small shareholdings (52.33%) are distributed on these three companies, whose holdings are multiplied by 2.098.

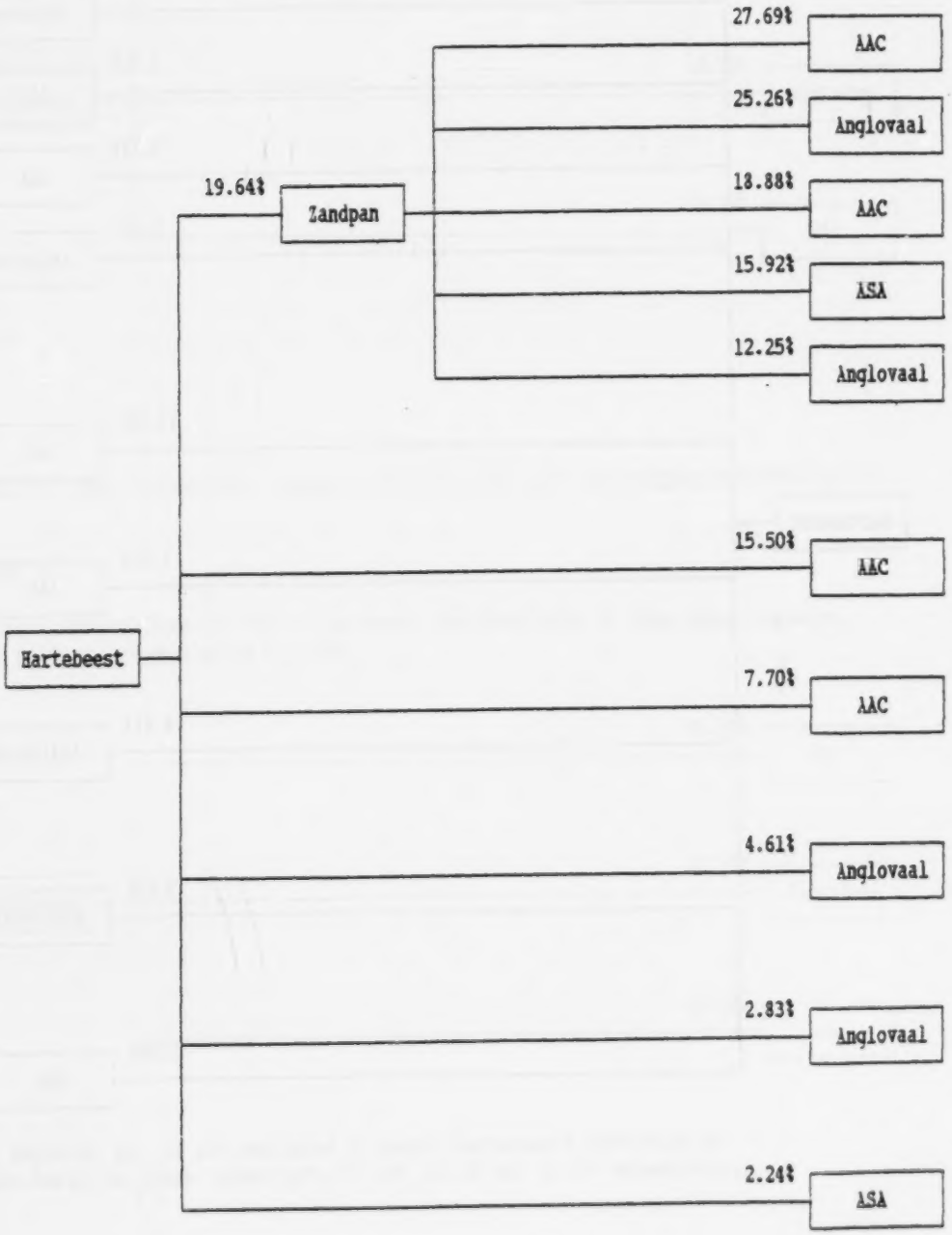


FIGURE 4. CONTROL CLASSIFICATION OF HARTEBEESTFONTEIN.

STEP 3.

Zandpan's holding is distributed on its shareholders

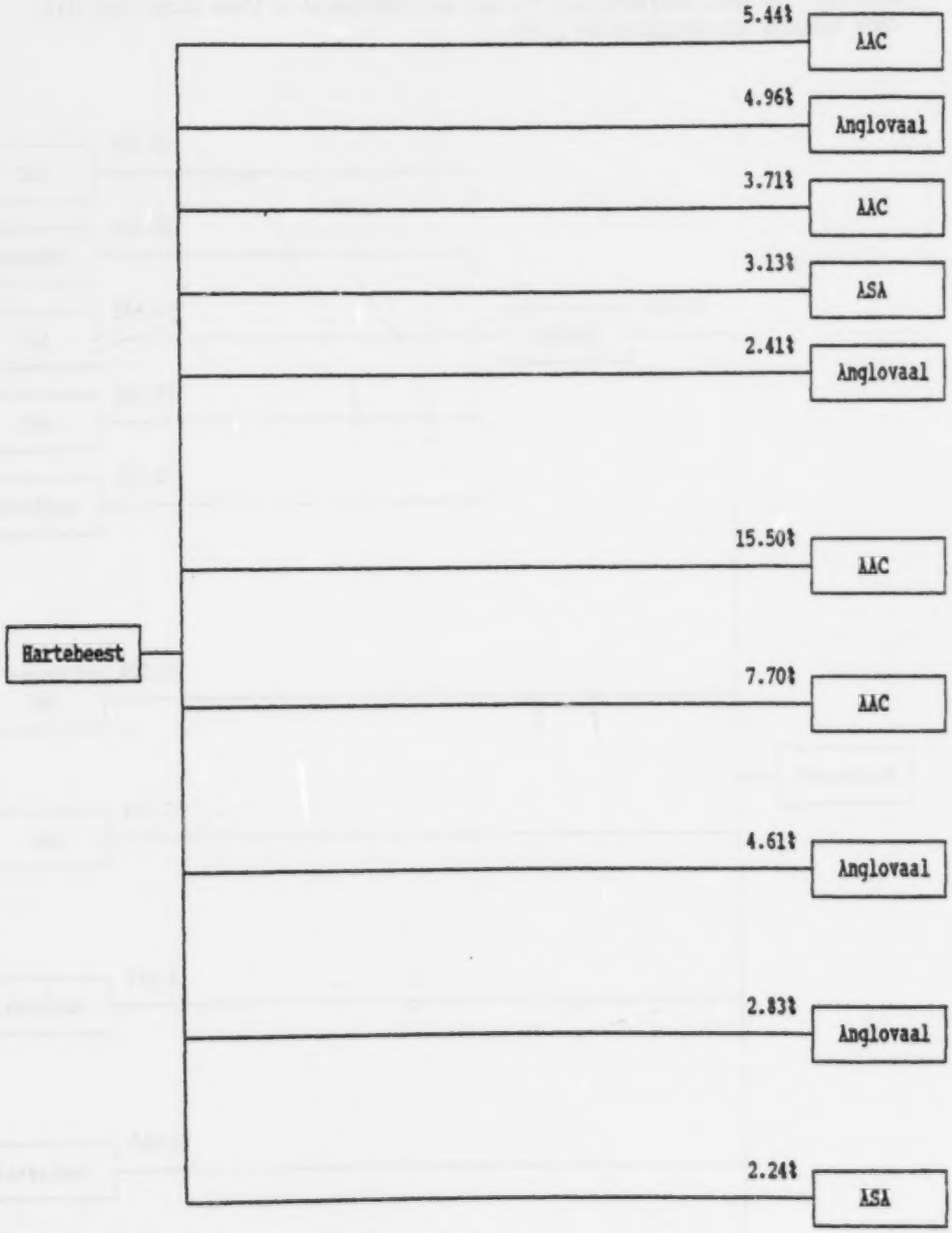


FIGURE 5. CONTROL CLASSIFICATION OF HARTEBEESTFONTEIN.

STEP 4.

There are three controlling companies left, which partially control Hartebeest: AAC, Anglovaal and ASA. Their holdings are summed.

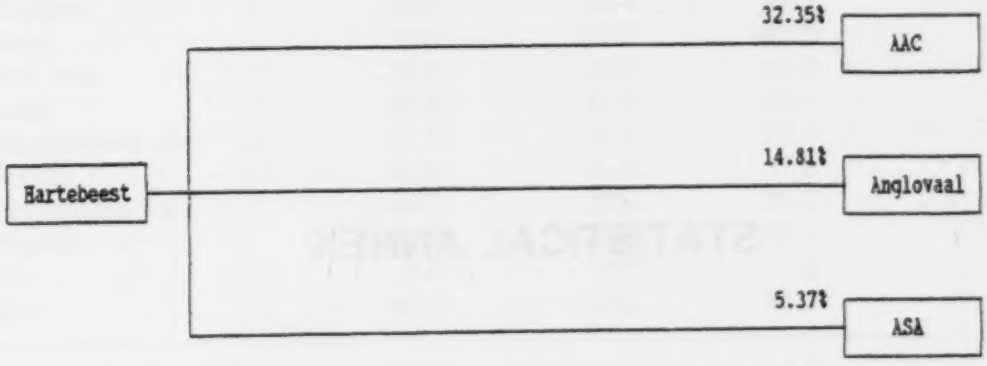
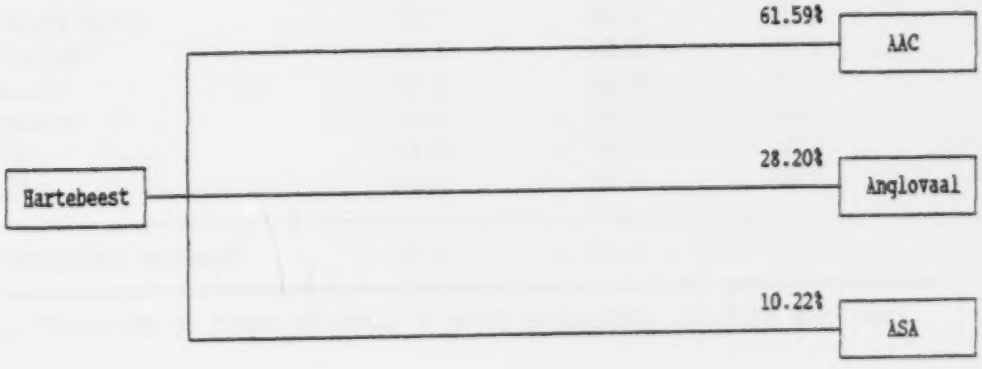


FIGURE M6. CONTROL CLASSIFICATION OF HARTEBEESTFONTEIN.

STEP 5.

The small shareholdings (47.48%) in Hartebeest are distributed on these three companies, whose holdings are multiplied by 1.904.



AAC, Anglovaal and ASA are considered to control Hartebeest's production in proportion to the shares shown above (61.59%, 28.20% and 10.22% respectively).

STATISTICAL ANNEX

Table 1. Developed market economy countries: mine production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Bauxite	35.8	38.6	38.9
Coal	-	40.4	39.1
Copper	36.6	30.4	32.5
Gold	70.5	61.2	63.6
Iron ore	39.6	29.8	28.3
Lead	46.4	44.4	46.0
Manganese ore	31.5	20.0	22.9
Nickel	49.5	40.3	37.8
Phosphate rock	44.3	35.6	35.0
Potash	53.5	54.0	50.1
Tin	8.6	8.1	7.2
Zinc	49.6	50.9	51.7
Weighted average[a]	50.4	43.3	44.0

a/ Weighted by share of value of world production, coal excluded

Table 2. Developed market economy countries: refined production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Alumina	62.0	60.1	55.2
Aluminium	69.1	64.3	59.8
Copper	53.7	48.0	49.9
Lead	52.5	52.9	51.7
Nickel	59.3	53.0	49.9
Tin	18.3	13.9	6.7
Zinc	58.3	60.2	56.7
Weighted average[a]	58.4	55.2	53.7

a/ Weighted by share of value of world production, alumina excluded.

Table 3. Developing countries: mine production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Bauxite	50.1	48.7	48.7
Coal	-	6.8	8.0
Copper	41.3	46.7	45.7
Gold	9.2	13.6	18.1
Iron ore	26.4	26.3	29.4
Lead	23.3	25.3	22.1
Manganese ore	28.4	27.1	26.7
Nickel	31.4	32.2	34.6
Phosphate rock	29.2	32.9	30.6
Potash	1.2	1.0	3.0
Tin	74.7	73.2	66.4
Zinc	22.3	23.7	23.0
Weighted average[a]	25.0	27.9	29.5

a/ Weighted by share of value of world production, coal excluded.

Table 4. Developing countries: refined production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Alumina	20.0	20.4	24.5
Aluminium	8.0	15.6	19.7
Copper	21.5	27.6	27.5
Lead	16.1	14.7	17.0
Nickel	17.7	17.4	19.7
Tin	63.7	66.6	70.9
Zinc	10.0	13.3	15.2
Weighted average[a]	16.6	21.6	22.6

a/ Weighted by share of value of world production, alumina excluded.

Table 5. Centrally planned economies: mine production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Bauxite	14.1	12.7	12.4
Coal	-	52.8	52.9
Copper	22.1	22.9	21.8
Gold	20.3	25.2	18.3
Iron ore	34.0	43.9	42.3
Lead	30.2	30.3	31.9
Manganese ore	40.1	52.9	50.4
Nickel	19.1	27.5	27.6
Phosphate rock	26.5	31.5	34.4
Potash	45.3	45.0	46.9
Tin	16.7	18.7	26.4
Zinc	28.1	25.4	25.3
Weighted average[a]	24.6	28.8	26.5

a/ Weighted by share of value of world production, coal excluded.

Table 6. Centrally planned economies: refined production, 1975-1989

Mineral	Share of total world prod. (%)		
	1975	1984	1989
Alumina	18.0	19.5	20.3
Aluminium	22.9	20.1	20.5
Copper	24.8	24.4	22.6
Lead	31.4	32.4	31.3
Nickel	23.0	29.6	30.4
Tin	18.0	19.5	22.4
Zinc	31.7	26.5	28.1
Weighted average[a]	25.0	23.2	23.7

a/ Weighted by share of value of world production, alumina excluded.

Table 7. Control of world mine production, regional averages

Mineral	Share of total world prod. (%) 1975	1984	1989
USA	18.3	10.8	11.7
Western Europe	13.4	10.5	11.5
South Africa	14.4	15.0	9.9
Canada	5.3	6.8	7.6
Australia	2.8	3.5	5.9
Japan	0.8	0.9	0.7
Total, developed[a]	55.2	47.8	47.7
Latin America	8.1	11.2	13.9
Asia	3.7	5.3	5.6
Africa	6.2	5.5	4.9
Total, developing[b]	20.0	23.3	25.6
CPEs	24.6	28.8	26.5
Grand total[c]	99.8	99.9	99.8

a/ Including Israel and New Zealand.
b/ Including Oceania and Yugoslavia.
c/ Weighted by share of value of world production. Figures do not add up to 100% due to independent rounding.

Table 8. Control of world refined production, regional averages

Mineral	Share of total world prod. (%) 1975	1984	1989
Western Europe	21.8	22.7	21.3
USA	21.6	16.5	16.6
Canada	9.2	9.1	9.3
Japan	8.2	6.9	6.1
Australia	1.8	2.0	3.2
South Africa	1.7	2.4	1.8
Total, developed[a]	64.3	59.8	58.3
Latin America	4.1	7.5	8.6
Africa	2.6	2.6	2.3
Asia	2.1	5.0	5.0
Total, developing[b]	10.9	17.0	18.0
CPEs	25.0	23.2	23.7
Grand total[c]	100.2	100.0	100.0

a/ Including Israel and New Zealand.
b/ Including Oceania and Yugoslavia.
c/ Weighted by share of value of world production. Figures do not add up to 100% due to independent rounding.

Table 9. Comparison between total mine production in developing countries and production controlled from developing countries, by mineral, 1975-1989

Mineral		Share of total world prod. (%) 1975	1984	1989
Bauxite	production	50.1	48.7	48.7
	control	18.2	24.3	27.7
Coal	production	..	6.8	8.0
	control	..	5.8	7.2
Copper	production	41.3	46.7	45.7
	control	30.6	35.0	34.0
Gold	production	9.2	13.6	18.1
	control	5.3	9.9	14.5
Iron ore	production	26.4	26.3	29.4
	control	23.7	22.3	26.6
Lead	production	23.3	25.3	22.1
	control	14.3	16.2	14.4
Manganese ore	production	28.4	27.1	26.7
	control	15.8	21.4	20.9
Nickel	production	31.4	32.2	34.6
	control	3.9	10.3	15.2
Phosphate rock	production	29.2	32.9	30.6
	control	25.6	31.8	30.4
Potash	production	1.2	1.0	3.0
	control	..	1.0	3.0
Tin	production	74.7	73.2	66.4
	control	62.7	65.7	61.3
Zinc	production	22.3	23.7	23.0
	control	14.8	18.3	18.6

Table 10. Comparison between total refined production in developing countries and production controlled from developing countries, by mineral, 1975-1989

Mineral		Share of total world prod. (%) 1975	1984	1989
Alumina	production	20.0	20.4	24.5
	control	5.6	9.5	12.9
Aluminium	production	8.0	15.6	19.7
	control	5.0	12.8	14.4
Copper	production	21.5	27.6	27.5
	control	18.2	25.0	26.2
Lead	production	16.1	14.7	17.0
	control	9.8	11.8	13.3
Nickel	production	17.7	17.4	19.7
	control	1.8	5.1	4.6
Tin	production	63.7	66.6	70.9
	control	34.1	40.7	51.7
Zinc	production	10.0	13.3	15.2
	control	8.6	12.4	15.0

Table 11. Comparison between total production in developing countries and production controlled from developing countries, 1975-1989. Summary

Average share of world production of selected minerals

	1975	1984	1989
MINE PRODUCTION			
A. Share controlled by companies based in the developing countries	20.0	23.3	25.6
B. Total production share of the developing countries	25.0	27.9	29.5
C. Ratio A/B	80%	84%	87%
REFINED PRODUCTION			
A. Share controlled by companies based in the developing countries	10.9	17.0	18.0
B. Total production share of the developing countries	16.6	21.6	22.6
C. Ratio A/B	66%	79%	80%

Table 12. Comparison between total mine production in developed market economy countries and production controlled from developed market economy countries, by mineral, 1975-1989

Mineral		Share of total world prod. (%) 1975	1984	1989
Bauxite	production	35.8	38.6	38.9
	control	67.7	63.0	59.9
Coal	production	..	40.4	39.1
	control	..	41.5	41.1
Copper	production	36.6	30.5	32.5
	control	47.3	42.1	44.0
Gold	production	70.5	61.2	63.6
	control	73.8	64.5	65.9
Iron ore	production	39.6	29.8	28.3
	control	42.3	33.8	31.1
Lead	production	46.4	44.4	46.0
	control	55.7	53.7	53.7
Manganese ore	production	31.5	20.0	22.9
	control	44.1	25.7	28.7
Nickel	production	49.5	40.3	37.8
	control	77.0	62.2	57.2
Phosphate rock	production	44.3	35.6	35.0
	control	47.9	36.4	35.2
Potash	production	53.5	54.0	50.1
	control	55.2	54.1	50.1
Tin	production	8.5	8.1	7.2
	control	20.5	15.6	12.3
Zinc	production	49.6	50.9	51.7
	control	57.2	56.0	52.6

Table 13. Comparison between total refined production in developed market economy countries and production controlled from developed market economy countries, by mineral, 1975-1989

Average share of world production

Mineral		Share of total world prod. (%) 1975	1984	1989
Alumina	production	62.0	60.1	55.2
	control	78.4	71.0	66.8
Aluminium	production	69.1	64.3	59.8
	control	72.1	67.1	65.1
Copper	production	53.7	48.0	49.9
	control	57.0	50.6	51.2
Lead	production	52.5	52.9	51.7
	control	58.8	55.8	55.4
Nickel	production	59.3	53.0	49.9
	control	75.2	65.3	65.0
Tin	production	18.3	13.9	6.7
	control	47.9	39.8	25.9
Zinc	production	58.3	60.2	56.7
	control	60.1	61.2	56.9

Table 14. Comparison between total production in developed market economy countries and production controlled from developed market economy countries, 1975-89. Summary.

Average share of world production of selected minerals.

	1975	1984	1989
MINE PRODUCTION			
A. Share controlled by companies based in the developed MECs	55.2	47.8	47.7
B. Total production share of the developed MECs	50.4	43.3	44.0
C. Ratio A/B	110%	110%	108%
REFINED PRODUCTION			
A. Share controlled by companies based in the developed MECs	64.3	59.8	58.3
B. Total production share of the developed MECs	58.4	55.2	53.7
C. Ratio A/B	110%	108%	109%

Table 15. Corporate concentration in selected minerals: mine production. Summary of changes

Mineral	Concentration in 1989 level			Change 1975-1989 level			Change 1984-1989 level		
	1	3	10	1	3	10	1	3	10
Nickel	32	47	77	+	0	-	+	+	-
Gold	27	35	51	--	--	--	--	--	--
Bauxite	18	38	77	-	--	-	0	0	0
Copper	18	32	64	+	+	+	+	-	-
Iron ore	18	32	56	++	++	+	+	+	+
Potash	17	44	79	0	-	-	-	-	-
Manganese	17	37	81	-	--	-	+	-	-
Phosphate	17	37	68	-	-	-	-	0	-
Tin	14	32	51	0	+	+	+	+	+
Zinc	10	21	48	+	0	+	-	+	0
Lead	9	22	53	+	-	+	-	-	-

Figures are shown as a percentage of Western world production.
Levels: 1=largest company, 3=three largest, 10=ten largest.
Changes: - decrease, + increase, 0 little or no change.

Table 16. Corporate concentration in selected minerals: refined production. Summary of changes

Mineral	Concentration in 1989 level			Change 1975-1989 level			Change 1984-1989 level		
	1	3	10	1	3	10	1	3	10
Nickel	29	45	81	-	-	0	+	+	+
Tin	17	42	84	--	--	-	+	0	0
Aluminium	13	31	60	-	-	-	-	-	-
Copper	12	23	50	+	+	0	0	0	-
Zinc	11	23	52	+	+	+	0	+	+
Lead	7	15	33	-	-	-	+	-	-

Figures are shown as a percentage of Western world production.
Levels: 1=largest company, 3=three largest, 10=ten largest.
Changes: - decrease, + increase, 0 little or no change.

Table 17. Corporate concentration of producers by region

	MINING				REFINING	
	Number of companies		Average share of world prod/company		Number of companies	Average share of world prod/company
	Incl. gold	Excl. gold	Incl. gold	Excl gold		
Australia	161	60	0.7	1.6	17	1.3
USA/Canada	345	179	0.5	0.9	47	2.3
Western Europe	111	104	0.6	0.6	93	1.3
South Africa	81	27	0.8	1.1	12	0.7
Japan	18	16	0.1	0.1	26	1.4
Latin America	215	172	0.7	0.9	51	1.4
Africa	100	76	0.8	1.0	19	0.8
Asia	131	103	0.8	0.9	40	1.7

Table 18. Corporate concentration of controlling companies by region

	MINING				REFINING	
	Number of companies		Average share of world prod/company		Number of companies	Average share of world prod/company
	Incl. gold	Excl. gold	Incl. gold	Excl gold		
Australia	80	34	0.9	1.8	14	1.5
USA/Canada	193	117	1.1	1.6	35	3.5
Western Europe	136	114	1.1	1.2	75	1.9
South Africa	49	32	1.4	1.2	10	1.2
Japan	19	15	0.3	0.3	25	1.4
Latin America	148	126	0.8	1.1	35	1.7
Africa	47	37	1.1	1.4	11	0.8
Asia	94	74	0.9	1.1	36	1.4

Table 19. Oil companies in mining, 1989

Company	Mineral	Volume	Rank
Amoco	Copper	40.92 kt	30
	Gold	4.77 t	49
	Silver	9.00 t	104
BP	Copper	27.71 kt	37
	Gold	3.22 t	64
	Silver	42.64 t	50
	Uranium	0.50 kt	17
	Zinc	21.71 kt	46
Chevron	Coal	14.90 Mt	29
	Palladium	2.60 t	5
	Platinum	0.72 t	7
ENI	Lead	9.69 kt	39
	Potash	0.15 Mt	14
	Uranium	0.10 kt	21
	Zinc	41.24 kt	30
Elf - Aquitaine	Phosphate	5.1 Mt	5
Exxon	Coal	30.70 Mt	14
	Copper	120.05 kt	15
	Gold	0.27 t	190
	Silver	27.14 t	66
	Zinc	13.82 kt	60
Freeport	Copper	144.00 kt	12
	Gold	11.91 t	17
	Phosphate	6.92 Mt	3
	Silver	61.30 t	34
	Uranium	0.56 kt	15
Mobil	Phosphate	4.00 Mt	8
Nerco	Coal	22.30 Mt	22
	Gold	5.18 t	42
	Silver	190.40 t	16
Oxy	Coal	19.80 Mt	25
	Phosphate	4.00 Mt	7
Shell	Bauxite	4.38 Mt	7
	Coal	28.70 Mt	16
	Gold	6.01 t	33
	Lead	7.85 kt	42
	Nickel	8.87 kt	14
	Silver	8.10 t	109
	Zinc	51.61 kt	27
Unocal	Molybdenum	1.54 kt	13
	Rare earths	20.79 kt	1

Table 20. Horizontal integration in the non-fuel minerals industries, 1989

	Theoretical maximum number of companies	1975	1984	1989
Mining stage	110	79	70	73
Refined stage	60	44	46	44
Combined	170	95	87	90

Note: Excluding coal.

Table 21. Mine and refined production controlled by the largest mining and refining companies in 1989. (Only those minerals are included in which the company is among the ten largest.)

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Alcan Aluminium Ltd, Canada			
Mining: Bauxite	9.3 Mt (est)	9.7	8.7
Refining: Aluminium	1705.0 kt (est)	11.8	9.4
Aluminum Co of America, USA			
Mining: Bauxite	16.9 Mt (est)	17.7	15.8
Refining: Aluminium	1884.0 kt (est)	13.0	10.4
Alusuisse, Switzerland			
Mining: Bauxite	5.8 Mt	6.1	5.5
Refining: Aluminium	448.0 kt	3.1	2.5
Amax Inc, USA			
Refining: Aluminium	622.0 kt	4.3	3.4
Anglo American Corp of South Africa Ltd, South Africa			
Mining: Copper	402.2 kt	5.6	4.4
Gold	433.2 t	26.5	21.4
Manganese ore	0.7 Mt	5.3	2.8
Nickel	42.7 kt	7.1	4.8
Potash	0.5 Mt	3.1	1.7
Refining: Nickel	30.5 kt	5.3	3.5
Anglovaal Ltd, South Africa			
Mining: Manganese ore	1.0 Mt	7.5	4.0
Asarco Inc, USA			
Mining: Copper	451.5 kt	6.3	4.9
Lead	107.1 kt	4.8	3.2
Zinc	159.7 kt	3.1	2.2
Refining: Copper	447.1 kt	5.3	4.1
Lead	193.1 kt	4.4	3.3
Banco Espanola de Credito S A (Asturiana de Zinc), Spain			
Refining: Zinc	218.1 kt	4.2	3.0
Barlow Rand Ltd, South Africa			
Mining: Gold	53.0 t	3.2	2.6
Best Metais e Soldas SA, Brazil			
Mining: Tin	3.0 kt (est)	1.7	1.3
Bethlehem Steel Corp, USA			
Mining: Iron ore	16.4 Mt (est)	2.9	1.7

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Brascan (incl Noranda), Canada			
Mining: Copper	194.6 kt	2.7	2.1
Nickel	30.1 kt	5.0	3.4
Potash	0.6 Mt	3.9	2.1
Zinc	492.4 kt	9.6	6.9
Tin	2.5 kt	1.4	1.1
Refining: Copper	352.0 kt	4.2	3.2
Nickel	43.1 kt	7.5	5.0
Tin	4.9 kt	2.7	2.1
Zinc	256.6 kt	4.9	3.5
Broken Hill Pty Co Ltd, Australia			
Mining: Iron ore	39.1 Mt (est)	6.9	4.0
Manganese ore	2.2 Mt	17.1	9.2
Carnon Consolidated Ltd, UK			
Mining: Tin	3.4 kt	1.9	1.5
Cia Auxiliar de Empresas de Mineracao, Brazil			
Mining: Iron ore	22.6 Mt (est)	4.0	2.3
Cia Minera Autlan SA de CV, Mexico			
Mining: Manganese ore	0.6 Mt	4.9	2.6
Cyprus Minerals Co, USA			
Mining: Copper	270.3 kt	3.8	3.0
Dalhold Investments Pty Ltd, Australia			
Mining: Nickel	16.6 kt	2.8	1.9
Fluor Corp, USA			
Mining: Lead	155.8 kt	6.9	4.7
Refining: Lead	137.4 kt	3.1	2.4
Freeport McMoran Inc, USA			
Mining: Phosphate rock	6.9 Mt	6.6	4.4
Gencor Ltd, South Africa			
Mining: Gold	65.5 t (est)	4.0	3.2
Manganese ore	1.1 Mt	8.7	4.7
Giant Resources Ltd (Curragh Resources), Australia			
Mining: Lead	94.5 kt	4.2	2.8
Zinc	133.4 kt	2.6	1.9
Hanson plc, UK			
Mining: Gold	72.6 t (est)	4.4	3.6
Tin	14.4 kt	8.3	6.5

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Hellenic Mining and Metallurgical Co of Larymna SA, Greece			
Mining: Nickel	16.1 kt	2.7	1.8
Refining: Nickel	16.1 kt	2.8	1.9
Homestake Mining Co, USA			
Mining: Gold	33.3 t	2.0	1.6
Lead	96.7 kt	4.3	2.9
Refining: Lead	101.6 kt	2.3	1.7
Horsehead Industries Inc, USA			
Refining: Zinc	186.0 kt (est)	3.6	2.6
Inco Ltd, Canada			
Mining: Nickel	195.0 kt	32.4	21.8
Refining: Nickel	167.8 kt	29.2	19.4
Industrias Penoles SA de CV, Mexico			
Refining: Lead	122.3 kt	2.8	2.1
International Minerals & Chemicals, USA			
Mining: Phosphate rock	14.0 Mt (est)	13.3	8.9
Potash	2.1 Mt (est)	12.8	7.0
Iscor Ltd, South Africa			
Mining: Iron ore	21.4 Mt	3.8	2.2
Jordan Phosphate Mines Co, Jordan			
Mining: Phosphate rock	6.7 Mt	6.4	4.2
BASF AG (Kali und Salz AG), Germany (FR)			
Mining: Potash	2.3 Mt	14.4	7.8
Kalium Canada Ltd, Canada			
Mining: Potash	0.6 Mt (est)	3.8	2.1
Korea Zinc Co, Republic of Korea			
Refining: Zinc	163.0 kt	3.1	2.3
Lac Minerals Ltd, Canada			
Mining: Gold	25.4 t	1.6	1.3
MIM Holdings Ltd, Australia			
Mining: Lead	210.7 kt (est)	9.4	6.3
Zinc	302.6 kt (est)	5.9	4.2
Refining: Copper	273.8 kt	3.3	2.5
Lead	163.6 kt (est)	3.7	2.8

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Magma Copper Co, USA			
Mining: Copper	194.5 kt	2.7	2.1
Maxxam Group Inc (Kaiser), USA			
Refining: Aluminium	501.0 kt (est)	3.5	2.8
Metallgesellschaft AG, Germany (FR)			
Mining: Lead	103.4 kt (est)	4.6	3.1
Zinc	208.7 kt (est)	4.1	2.9
Refining: Lead	106.7 kt (est)	2.4	1.8
Zinc	282.5 kt	5.4	3.9
Minsur SA, Peru			
Mining: Tin	5.1 kt	2.9	2.3
Mitsubishi Corp, Japan			
Refining: Copper	270.0 kt (est)	3.2	2.5
Mitsui & Co Ltd, Japan			
Refining: Zinc	183.3 kt (est)	3.5	2.6
Mobil Corp, USA			
Mining: Phosphate rock	4.0 Mt (est)	3.8	2.5
Nippon Mining Co Ltd, Japan			
Refining: Copper	285.0 kt	3.4	2.6
North Broken Hill Peko Ltd, Australia			
Mining: Lead	111.0 kt	4.9	3.3
Zinc	186.5 kt	3.6	2.6
North Broken Hill Peko Ltd, Australia (continued)			
Refining: Lead	111.4 kt	2.5	1.9
Zinc	242.5 kt	4.7	3.4
Occidental Petroleum Corp, USA			
Mining: Phosphate rock	4.0 Mt (est)	3.8	2.5
Iscor Ltd, South Africa			
Mining: Manganese ore	0.8 Mt	6.3	3.4
Pacific Metals Co Ltd, Japan			
Refining: Nickel	36.0 kt	6.3	4.2
Paranapanema SA, Brazil			
Mining: Tin	16.5 kt	9.5	7.4
Refining: Tin	27.1 kt	14.9	11.7

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Phelps Dodge Corp, USA			
Mining: Copper	507.8 kt	7.1	5.6
Refining: Copper	506.4 kt	6.0	4.7
Placer Dome Inc, Canada			
Mining: Gold	43.9 t (est)	2.7	2.2
Preussag AG Metall, Germany (FR)			
Refining: Lead	314.2 kt	7.1	5.4
Tin	17.0 kt	9.4	7.3
Zinc	322.9 kt	6.2	4.5
RTZ Corporation plc, UK			
Mining: Bauxite	9.7 Mt	10.1	9.1
Copper	488.7 kt (est)	6.8	5.4
Gold	38.0 t (est)	2.3	1.9
Iron ore	42.2 Mt	7.5	4.3
Lead	121.4 kt	5.4	3.6
Potash	0.4 Mt	2.6	1.4
Tin	4.5 kt	2.6	2.0
Zinc	218.2 kt	4.2	3.1
Refining: Aluminium	530.0 kt	3.7	2.9
Copper	324.4 kt (est)	3.9	3.0
Lead	111.4 kt	2.5	1.9
Tin	10.8 kt	6.0	4.7
Zinc	302.7 kt	5.8	4.2
Rembrandt Group, South Africa			
Mining: Gold	32.0 t	2.0	1.6
Reynolds Metals Co, USA			
Refining: Aluminium	850.0 kt (est)	5.9	4.7
Rio Tuba Nickel Mining Corp, Philippines			
Mining: Nickel	15.4 kt	2.6	1.7
Royal Dutch/Shell Group, UK			
Mining: Bauxite	3.3 Mt (est)	3.5	3.1
Refining: Tin	19.4 kt	10.7	8.4
Sherritt Gordon Mines Ltd, Canada			
Refining: Nickel	21.1 kt	3.7	2.4
State of Bolivia, Bolivia			
Mining: Tin	4.0 kt	2.3	1.8
Refining: Tin	9.5 kt	5.2	4.1

	Controlled production	Share of Western world production (%)	Share of total world production (%)
State of Brazil, Brazil			
Mining: Bauxite	4.3 Mt	4.5	4.0
Iron ore	99.1 Mt	17.5	10.1
Manganese ore	0.8 Mt	6.2	3.3
State of Canada, Canada			
Mining: Potash	2.7 Mt (est)	16.6	9.0
State of Chile, Chile			
Mining: Copper	1268.2 kt	17.7	13.9
Refining: Copper	1011.9 kt	12.1	9.3
State of Finland, Finland			
Mining: Zinc	236.7 kt	4.6	3.3
State of France, France			
Mining: Nickel	46.9 kt	7.8	5.2
Phosphate rock	5.1 Mt (est)	4.9	3.2
Potash	1.4 Mt (est)	8.8	4.8
Refining: Aluminium	956.0 kt	6.6	5.3
Nickel	46.2 kt	8.0	5.3
State of Gabon, Gabon			
Mining: Manganese ore	1.1 Mt	8.8	4.7
State of Guinea, Guinea			
Mining: Bauxite	9.8 Mt (est)	10.3	9.2
State of India, India			
Mining: Iron ore	22.3 Mt	3.9	2.3
State of India, India (continued)			
Mining: Manganese ore	0.8 Mt (est)	5.8	3.1
State of Indonesia, Indonesia			
Mining: Nickel	30.6 kt	5.1	3.4
Tin	23.8 kt	13.8	10.7
Refining: Tin	29.9 kt	16.5	12.9
State of Israel, Israel			
Mining: Potash	1.3 Mt	7.9	4.3
State of Italy, Italy			
Refining: Lead	76.5 kt	1.7	1.3
State of Jamaica, Jamaica			
Mining: Bauxite	2.8 Mt (est)	3.0	2.7

	Controlled production	Share of Western world production (%)	Share of total world production (%)
State of Jordan, Jordan			
Mining: Potash	0.8 Mt	4.9	2.7
State of Malaysia, Malaysia			
Mining: Tin	10.3 kt (est)	6.0	4.6
Refining: Tin	14.2 kt	7.9	6.1
State of Morocco, Morocco			
Mining: Phosphate rock	18.0 Mt	17.1	11.4
State of Norway, Norway			
Refining: Aluminium	625.0 kt (est)	4.3	3.5
State of Peru, Peru			
Mining: Zinc	212.4 kt	4.1	3.0
State of South Africa, South Africa			
Mining: Phosphate rock	2.8 Mt	2.7	1.8
State of Sweden, Sweden			
Mining: Iron ore	21.6 Mt	3.8	2.2
State of Togo, Togo			
Mining: Phosphate rock	3.5 Mt	3.3	2.2
State of Tunisia, Tunisia			
Mining: Phosphate rock	6.6 Mt	6.3	4.2
State of Venezuela, Venezuela			
Mining: Iron ore	18.1 Mt	3.2	1.8
Refining: Aluminium	502.0 kt	3.5	2.8
State of Yugoslavia, Yugoslavia			
Mining: Bauxite	3.3 Mt	3.4	3.0
Lead	79.2 kt	3.5	2.4
State of Zaire, Zaire			
Mining: Copper	440.6 kt (est)	6.2	4.8
State of Zambia, Zambia			
Mining: Copper	351.2 kt	4.9	3.8
Refining: Copper	323.6 kt	3.9	3.0
Straits Trading Co Ltd, Singapore			
Refining: Tin	19.7 kt	10.8	8.5
Sté Générale de Belgique, Belgium			
Refining: Copper	397.0 kt	4.7	3.7
Zinc	555.8 kt	10.7	7.7
Sumitomo Corp, Japan			
Refining: Nickel	38.0 kt	6.6	4.4

	Controlled production	Share of Western world production (%)	Share of total world production (%)
Trelleborg AB, Sweden			
Mining: Lead	113.2 kt	5.0	3.4
Nickel	30.1 kt	5.0	3.4
Zinc	300.2 kt	5.8	4.2
Refining: Nickel	43.1 kt	7.5	5.0
USX Corp, USA			
Mining: Iron ore	13.7 Mt	2.4	1.4
Manganese ore	1.4 Mt	10.6	5.7
Western Mining Corp Holdings Ltd, Australia			
Mining: Bauxite	8.6 Mt	9.0	8.0
Gold	30.9 t (est)	1.9	1.5
Nickel	42.0 kt	7.0	4.7
Refining: Nickel	21.0 kt (est)	3.7	2.4

Source: RMG Data.

Table 22. The fifty largest companies by value in 1989

Rank	Controlling company	Country	Approx. share of total value of Western world mine production of non-fuel minerals (%) cumulated	
1	Anglo American Corp of SA	South Africa	9.56	9.56
2	RTZ Corporation plc	UK	4.29	13.85
3	Gov't of Brazil (mainly CVRD)	Brazil	2.78	16.62
4	Gov't of Chile (m. Codelco)	Chile	2.68	19.31
5	Gencor Ltd	South Africa	1.81	21.12
6	Brascan Ltd	Canada	1.79	22.90
7	Broken Hill Pty Co Ltd	Australia	1.57	24.47
8	Harrison plc	UK	1.55	26.03
9	Asarco Inc	USA	1.46	27.49
10	Gov't of Zaire (m. Gecamines)	Zaire	1.41	28.89
11	Inco Ltd	Canada	1.35	30.24
12	Phelps Dodge Corp	USA	1.11	31.35
13	MIM Holdings Ltd	Australia	1.09	32.43
14	Placer Dome Inc	Canada	1.02	33.45
15	Western Mining Corp	Australia	0.95	34.41
16	Trelleborg AB	Sweden	0.93	35.34
17	Gov't of France (various)	France	0.91	36.25
18	International Minerals & Che	USA	0.90	37.15
19	Gov't of India (various)	India	0.89	38.04
20	South African Mutual Life	South Africa	0.87	38.91
21	Cyprus Minerals Co	USA	0.87	39.77
22	Gov't of Morocco (m. OCP)	Morocco	0.80	40.58
23	Freeport McMoran Inc	USA	0.76	41.34
24	Gov't of Zambia (m. ZCCM)	Zambia	0.74	42.08
25	Gov't of Peru (various)	Peru	0.72	42.80
26	Gov't of Yugoslavia (various)	Yugoslavia	0.69	43.49
27	North Broken Hill Peko Ltd	Australia	0.66	44.15
28	Metallgesellschaft AG	Germany (FR)	0.63	44.77
29	Gov't of Indonesia(m Tam.Tim.)	Indonesia	0.60	45.37
30	Homestake Mining Co	USA	0.59	45.96
31	Amax Inc	USA	0.59	46.55
32	Caemi	Brazil	0.58	47.13
33	Iscor Ltd	South Africa	0.58	47.70
34	Gov't of Canada (various)	Canada	0.53	48.24
35	Gov't of Sweden (m. LKAB)	Sweden	0.52	48.76
36	Aluminum Co of America	USA	0.51	49.27
37	Rembrandt Group	South Africa	0.51	49.77
38	Lac Minerals Ltd	Canada	0.47	50.24
39	Industrial Minera Mexico	Mexico	0.46	50.70
40	Gov't of Venezuela (various)	Venezuela	0.45	51.15
41	Magma Copper Co	USA	0.42	51.57
42	Gov't of Finland (Outokumpu)	Finland	0.41	51.98
43	USX Corp	USA	0.40	52.38
44	Bethlehem Steel Corp	USA	0.39	52.78
45	Gov't of Malaysia (m. MMC)	Malaysia	0.39	53.17
46	Permodalan Nasional Bhd	Malaysia	0.39	53.55
47	Echo Bay Mines Ltd	Canada	0.39	53.94
48	Kali und Salz AG	Germany (FR)	0.38	54.31
49	Mitsui & Co Ltd	Japan	0.36	54.67
50	Sté Générale de Belgique	Belgium	0.35	55.03
Total, states			14.52	
TOTAL ALL			55.03	

Table 23. State control in selected minerals. Mine production

	State controlled share of total Western world mine production (%)								
	Developed MECs			Developing countries			All Western world		
	1975	1984	1989	1975	1984	1989	1975	1984	1989
Bauxite	3.5	6.9	5.4	16.9	22.3	24.4	20.4	29.2	29.8
Coal	..	11.8	10.9	..	7.9	8.4	..	19.7	19.4
Copper	3.0	7.7	3.3	31.3	38.0	35.7	34.3	45.8	39.0
Gold	0.7	2.0	0.6	2.3	2.6	2.3	2.9	4.5	2.9
Iron ore	7.8	13.7	8.1	21.6	27.1	31.0	29.4	40.9	39.1
Lead	6.5	9.9	5.7	5.9	8.1	6.5	12.3	18.0	12.2
Manganese	25.3	2.1	1.6	11.2	24.0	23.4	36.5	26.1	24.9
Nicke	I.0	13.9	11.7	2.6	6.7	6.4	3.7	20.6	18.2
Phosphate	3.7	10.3	10.0	30.1	34.6	34.3	33.7	44.9	44.3
Potash	23.6	41.4	34.2	-	1.2	5.6	23.6	42.6	39.8
Tin	0.4	1.4	-	27.2	28.5	20.3	27.6	29.9	20.3
Zinc	6.0	8.6	7.3	8.7	10.1	9.0	14.8	18.7	16.3

Table 24. State control in selected minerals. Refined production

	State controlled share of total Western world mine production (%)								
	Developed MECs			Developing countries			All Western world		
	1975	1984	1989	1975	1984	1989	1975	1984	1989
Alumina	8.4	14.7	13.3	4.5	6.3	9.8	12.9	21.0	23.2
Aluminium	11.9	19.9	22.1	3.5	8.5	11.0	15.3	28.4	33.1
Copper	2.8	5.5	3.3	18.9	27.2	26.2	21.6	32.8	29.5
Lead	4.7	11.1	3.4	3.1	3.2	2.8	7.7	14.3	6.2
Nickel	1.3	10.3	12.5	-	2.7	2.3	1.3	13.0	14.8
Tin	0.3	1.0	-	13.5	26.7	25.8	13.8	27.7	25.8
Zinc	9.4	11.7	8.9	4.6	7.0	5.5	14.0	18.7	14.4

Table 25. Important nationalizations and privatizations 1975 - 1989

Country	Company	P/N	Year	Change in state share
8Brazil	CVRD	P	1983	64 to 56 %
		P	1991	56 to 51 %
Canada	PCS	N	1976	0 to 100 %
		P	1989	100 to 30 %
Chile	CAP	P	1985-87	gradual decrease 51 to 0%
France	Pechiney	N	1982	0 to 100 %
	Imétal	N	1982	0 to 55 %
		P	1988	55 to 5 %
	SLN	N	1982	50 to 90 %
Germany	VAW	P	1986	100 to 60 %
		P	1988	60 to 0 %
Jamaica	Jamalco	N	1976	0 to 6 %
		N	1988	6 to 50 %
	Kaiser Bauxite	N	1977	0 to 51 %
	Jamalcan	N	1978	0 to 7 %
Malaysia	MMC	N	1977	0 to 56 %
Mexico	Mexicana de Cobre	P	1989	44 to 0 %
	Real de Angeles	P	1989	33 to 0 %
South Africa	Iscor	P	1989	100 to 16 %
Spain	Apirca	P	1987	100 to 0 %
United Kingdom	BP		1970s/80s	49 to 0 %
Zambia	ZCCM	N	1979	increase to 60 %

Table 26. State shares of Western world mine production Approximate value.

Group *		Country's share of Western world mine prod. value %	State share mine prod. value %
GROUP 1	USA	12.5	.0
< 20%	South Africa	11.8	.2
	Canada	10.8	.3
	Australia	10.7	.1
	Mexico	2.0	.2
	N Caledonia	1.3	.0
	Philippines	1.2	.0
	Papua Guinea	1.0	.0
	Colombia	.6	.1
	Zimbabwe	.5	.1
	Dominican Rep	.5	.1
	Spain	.8	.0
GROUP 2	Chile	5.2	3.8
20-80%	Brazil	4.7	1.9
	Zambia	1.5	1.1
	Peru	2.8	1.0
	India	1.5	.8
	Indonesia	1.6	.6
	Sweden	1.0	.4
	Botswana	.9	.3
	Guinea	.3	.2
	Turkey	.3	.2
	Portugal	.3	.2
	Ghana	.2	.1
	Gabon	.3	.1
	Bolivia	.4	.1
	Liberia	.1	.1
	Ecuador	.1	.1
GROUP 3	Zaire	2.2	1.8
80-100%	Yugoslavia	.8	.8
	Morocco	.9	.8
	Venezuela	.4	.3
	Tunisia	.3	.3
	Iran, Islamic Rep. of	.3	.3
	Mauritania	.2	.2
	Israel	.2	.2
	Togo	.1	.1
	Algeria	.1	.1
	Italy	.1	.1
	Senegal	.1	.1
	Egypt	.1	.1
	Austria	.1	.1
GROUP 4	France	.4	1.9
> 100%	Finland	.4	.8
	Malaysia	.4	.6
	Luxembourg	-	.2

a/ Percentage figure shows the approximate shares of the state companies of the value of all non-fuel minerals produced in the country

Table 27. Identification of states controlling significant shares[a] of Western world mine production of important minerals, 1989

Mineral	Controlling state	
	Industrialized countries	Developing countries
Bauxite	Yugoslavia	Guinea,[b] Brazil, India
Copper	-	Chile,[b] Zaire, Zambia
Gold	-	-
Iron ore	Sweden	Brazil,[b] India, Venezuela
Lead	Yugoslavia	Peru
Nickel	France[b]	Indonesia
Phosphate	-	Morocco,[b] Tunisia
Potash	Canada, Israel, France	Jordan
Tin	-	Indonesia[b], Bolivia, Malaysia
Zinc	-	Peru

a/ "Significant share" is defined as more than 3 per cent of Western world mine production.
b/ Controlling more than 10 per cent of Western world mine production.